CHAPTER 9

TREATMENT PERFORMANCE DATA USED FOR THE DEVELOPMENT OF LONG-TERM AVERAGES, VARIABILITY FACTORS, AND STANDARDS

9.1 Introduction

This chapter discusses the treatment performance data collected by and available to EPA for use in calculating long-term average concentrations for the pollutants of concern and long-term averages, variability factors, and standards for the constituents and pollutant parameters proposed for regulation. The pollutants of concern and the pollutants proposed for regulation are presented in Chapter 7. The following information is presented in this chapter:

- Section 9.2 describes and classifies the sources of the treatment performance data used by EPA in the calculation of the long-term averages, variability factors, and standards into six treatment technology groups;
- Section 9.3 describes the data-editing procedures used to identify data points considered appropriate for calculating long-term averages, variability factors, and standards for the five postlaundering treatment technology groups;
- Section 9.4 presents the long-term averages for the five postlaundering treatment technology groups for the pollutants of concern;
- Section 9.5 presents the long-term average concentrations, variability factors, and concentration-based standards calculated for the five postlaundering treatment technology groups for the pollutants proposed for regulation;
- Section 9.6 presents the methodology used to calculate target effluent concentrations for steam tumbling, the prelaundering treatment technology group;
- Section 9.7 presents EPA's analysis on the development of mass-based standards; and
- Section 9.8 presents the references used.

9.2 Sources of Treatment Technology Performance Data From Well-Designed and Well-Operated Treatment Systems

EPA used two sources of treatment performance data to calculate the long-term average concentrations, variability factors, and standards for industrial laundries wastewater treatment systems: EPA industrial laundry sampling data and Detailed Monitoring Questionnaire (DMQ) data. Chapter 3 describes these sources. EPA first considered sampling data from industrial laundries with well-designed and well-operated treatment systems representing the various treatment technologies to calculate long-term average concentrations, variability factors, and standards. Chapter 8 describes the treatment technologies used as the basis for the proposed standards. EPA also used DMQ data from facilities using treatment technologies equivalent to the treatment technologies sampled by EPA. Sections 9.2.1 and 9.2.2, respectively, discuss the EPA industrial laundry sampling data and the DMQ data used for standards development.

9.2.1 Industrial Laundry Sampling Program Data

EPA considered industrial laundry wastewater data from the following Agency sampling programs for use in calculating long-term average concentrations, variability factors, and standards: the 1985-1987 Industrial Technology Division (ITD)/Resource Conservation and Recovery Act (RCRA) Sampling Program and the 1993-1996 sampling program. No data from the 1985-1987 ITD/RCRA Sampling Program were used to calculate long-term averages, variability factors, and standards. However, data from the 1993-1996 sampling program were used in these calculations. The identification of sampling data representative of well-designed and well-operated treatment systems from these sampling programs is presented below.

1985-1987 ITD/RCRA Sampling Program

EPA collected wastewater samples from five industrial laundries between 1985 and 1987 as part of the ITD/RCRA Sampling Program. EPA reviewed the ITD/RCRA Sampling Program data to identify data from facilities with well-designed and well-operated treatment systems representative of wastewater treatment technologies used as the basis for the proposed standards. EPA determined that none of the ITD/RCRA Sampling Program data could be used to calculate long-term average concentrations, variability factors, or standards, for the following reasons. One facility used a dissolved air flotation unit that was not operating properly during the sampling episode. EPA decided that the sampling data from this facility could not be used because the treatment system was not well operated. At a second facility, grab sample water was added to some of the composite samples to make up for insufficient volume of the composite samples. EPA decided that sampling data for this facility was not representative of the wastewater from the facility. A third facility used ultrafiltration as its main treatment technology. EPA does not consider ultrafiltration to be an effective treatment for industrial laundry wastewater because the filter is easily clogged from oil and grease in the wastewater. This is supported by several industrial laundries that have tried using ultrafiltration but have subsequently replaced the ultrafilter with a different technology. The final two facilities used only settling basins; however, EPA does not consider settling basins to represent effective treatment for the

pollutants of concern in industrial laundry wastewater. Therefore, EPA decided that sampling data from these five facilities could not be used for standards development.

1993-1996 EPA Sampling Program

EPA collected wastewater samples from eight industrial laundries between 1993 and 1996 as part of the data-gathering effort for development of the proposed industrial laundries rule. Facilities were selected based on site visits and responses to the detailed questionnaire. One sampling episode was performed at each facility. The sampling data collected by EPA included both influent and effluent wastewater data representing the major treatment technology used by each facility. At each facility, EPA collected data for all of the pollutants of concern. The eight sampled industrial laundries used one of the following major wastewater treatment technologies as part of their overall treatment system (one sampled facility used two major wastewater treatment technologies, chemical precipitation and organics control):

- Chemical emulsion breaking;
- Dissolved air flotation (DAF);
- Chemical precipitation;
- Ultrafiltration;
- Vacuum degassing; and
- Organics control (steam tumbling).

In addition to classifying the eight sampled facilities into groups depending on the treatment technology used by the facility, EPA also classified the eight facilities into groups depending on the type of wastewater treated by the treatment technology. Some of the sampled facilities treated all of their process wastewater while others treated only the heavy wastewater (i.e., wastewater from the washing of heavily soiled items (e.g., shop and printer towels/rags) or wastewater containing high pollutant concentrations from certain breaks in the washing cycle).

One facility sampled by EPA steam-tumbled its shop and printer towels/rags prior to water washing. The quantity and type of data available for steam tumbling were different from the data available for the other treatment technologies. EPA developed target effluent concentrations for this prelaundering treatment technology group instead of long-term averages, variability factors, and standards. Section 9.6 of this document presents the methodology used to calculate the target effluent concentrations for steam tumbling.

The data obtained by EPA during sampling episodes at industrial laundries using ultrafiltration and vacuum degassing do not demonstrate effective treatment of industrial laundry wastewater. EPA's ultrafiltration data represent one day of treatment of wastewater from laundering of only printer towels. In addition, as discussed earlier in this section, ultrafilters are easily clogged from oil and grease in industrial laundry wastewater. Vacuum degassing, which was sampled at one facility, is used to remove volatile organics from wastewater. The sampling data for vacuum degassing did not demonstrate effective removal of volatile organics. Because ultrafiltration and vacuum degassing were not found to be effective in treating industrial laundry

wastewater, EPA did not calculate long-term average concentrations, variability factors, or standards for these treatment technologies.

The remaining sampling data represented the following five treatment groups based on whether the facility sampled was treating all of its process wastewater or only heavy wastewater:

- Chemical emulsion breaking treatment of heavy wastewater;
- DAF treatment of heavy wastewater;
- Chemical precipitation treatment of heavy wastewater;
- DAF treatment of all facility process wastewater; and
- Chemical precipitation treatment of all facility process wastewater.

Sampling data from the six facilities representing these five postlaundering treatment technology groups were used to calculate long-term average concentrations, variability factors, and standards. The number of sampled facilities representing each postlaundering treatment technology group is presented in the following table.

Number of Sampled Facilities Representing Each Treatment Technology Group				
Chemical Emulsion Breaking Treatment of Heavy Wastewater	**DAF Treatment of Heavy Wastewater**	**Chemical Precipitation of Heavy Wastewater**	**DAF Treatment of All Facility Process Wastewater**	**Chemical Precipitation of All Facility Process Wastewater**
1	1	1	2	1

9.2.2 Detailed Monitoring Questionnaire (DMQ) Data

In 1995, EPA developed and mailed the DMQ to 37 facilities throughout the United States (as described in Chapter 3). In response to this questionnaire, the industrial laundries provided EPA with all available 1993 facility monitoring data. DMQ data generally represented fewer pollutants than were analyzed for during the sampling program, and most of the data provided were for final effluent only, without corresponding influent data to evaluate treatment system pollutant removals. EPA reviewed the DMQ data to determine if the data could be used to represent any of the five wastewater treatment technology groups sampled by EPA.

The wastewater treatment technology groups sampled by EPA include treatment through chemical emulsion breaking, DAF, and chemical precipitation. EPA used the following design and operating criteria to determine whether the DMQ data were representative of one of these three major wastewater treatment technologies sampled:

- Chemical Emulsion Breaking--pH of wastewater is adjusted with acid and an oil removal mechanism is in place.

- DAF--flocculation and coagulation chemicals are added, an air injection mechanism is in place, and a removal system for float sludge is in place.

- Chemical Precipitation--flocculation and coagulation chemicals are added and a settling mechanism is in place.

EPA determined that 17 of the 37 DMQ facilities did not provide data representative of these treatment technologies sampled by EPA. Facility diagrams for the remaining 20 facilities, which were using one of these three treatment technologies, were then examined to determine if the sampling points for which data were reported represent final effluent from the treatment technology. EPA determined that 9 of the 20 facilities did not meet this criterion. (EPA did not receive paired data for any of the 20 DMQ facilities using one of these three wastewater treatment technologies sampled by EPA. Therefore, the criterion requiring data to be representative of the influent to one of these three treatment technologies could not be used.) The remaining eleven facilities provided data representing wastewater effluent concentrations for either DAF treatment of all facility process wastewater (five facilities) or chemical precipitation treatment of all facility process wastewater (six facilities). These data were used in conjunction with EPA's sampling data to calculate long-term average concentrations, variability factors, and standards.

9.3 Evaluation of Treatment Performance Data

After identifying available treatment performance data, EPA identified specific data points that were not considered representative of well-designed, well-operated treatment systems. These data points were not used to calculate long-term averages, variability factors, and standards for each of the five wastewater treatment technology groups incorporating chemical emulsion breaking, DAF, or chemical precipitation as the primary treatment unit. The following criteria were used to identify these data points:

- Assessment of performance of the treatment system at the sampled facilities and DMQ facilities identified above including identification of process upsets during sampling that impacted the performance of the treatment system;

- Identification of pollutants not treated by the treatment technology;
- Identification of pollutants not present in influent samples at sufficient concentrations to evaluate treatment effectiveness of the treatment technology;
- Identification of treatment performance data with inconsistent detection limits; and
- Identification of data considered a lower limit of the actual value.

These criteria are further described in Sections 9.3.1 through 9.3.4 of this document.

9.3.1 Assessment of Treatment System Performance and Identification of Process Upsets

The available data were reviewed to determine if the treatment systems for which effluent data were available were well operated during the time when samples were collected. The criteria used to determine good system operation are dependent on the treatment technology being evaluated; the following parameters are indicative of the three major treatment technologies for which data were available:

- Chemical Emulsion Breaking: proper pH and removal of oil and grease;
- DAF: removal of TSS and removal of oil and grease; and
- Chemical Precipitation: removal of TSS and removal of oil and grease.

For EPA sampling episodes, EPA reviewed sampling episode reports to determine if any process upsets occurred during one or more days of the sampling episode. DMQ data could not be evaluated using this criterion because no facilities representing one of the three major wastewater treatment technologies sampled provided paired influent and effluent data. Data that did not meet the evaluation criterion were flagged as unusable.

9.3.2 Identification of Pollutants Not Treated by the Treatment Technology

The data for each EPA sampling episode were reviewed to identify pollutants that were not treated by the treatment technology sampled. If the average concentration of the pollutant in the effluent samples from a facility was greater than or equal to the average concentration of the pollutant in the influent samples, the data were flagged as unusable. DMQ data could not be evaluated using this criterion because no paired influent and effluent data were provided.

9.3.3 Identification of Pollutants Not Present in Influent Samples at Sufficient Concentrations to Evaluate Treatment Effectiveness

The data for each EPA sampling episode were reviewed to determine if a pollutant of concern was not detected in sufficient concentrations to evaluate treatment effectiveness. If the pollutant was never detected in influent samples at a facility or if the average concentration of a pollutant in the influent samples collected from a facility was less than ten times the method detection level for that pollutant, the data for that pollutant at that facility were flagged as unusable for calculating long-term averages, variability factors, and standards. DMQ data could not be evaluated using this criterion because no paired influent and effluent data were provided.

9.3.4 Identification of Treatment Performance Data With Inconsistent Detection Limits

The data for each pollutant at each sampling episode were reviewed to identify results showing inconsistent detection limits. If an analytical method used for a pollutant during a particular episode gave inconsistent detection limits due to laboratories having different instruments to measure pollutant concentrations, the data for this pollutant and episode were flagged as unusable. EPA identified data from three sampling episodes for four organic pollutants (toluene, naphthalene, tetrachloroethene, and ethylbenzene) that showed inconsistent detection limits. These data were not used in calculating long-term averages, variability factors, and standards, although other data were available to use in calculating values for these pollutants.

9.3.5 Identification of Data Considered a Lower Limit of the Actual Value

The sampling data were reviewed to identify pollutant concentrations qualified with a greater than (>) sign. For these pollutants, EPA considered the reported concentration value to be a lower limit of the actual concentration value. EPA did not use the data from these samples to calculate long-term averages, variability factors, and standards.

9.4 Long-Term Average Concentrations for the Pollutants of Concern

The data meeting the review requirements presented in Section 9.3 of this document were used to calculate long-term average concentrations for the 72 pollutants of concern for each of the five postlaundering treatment technology groups. Long-term averages for each pollutant of concern for each sampling episode were calculated using equations derived from an adapted delta-lognormal model that accounts for effluent samples with a pollutant concentration at the detection limit. The detection limit concentration was used in calculations for data points reported as non-detects. The methodology used to calculate long-term averages, variability factors, and standards is presented in the Statistical Support Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category (1). EPA calculated the overall long-term average concentrations for each pollutant of concern by finding the median of the episode long-term average concentrations. When both sampling and DMQ data met the data review criteria for a specific pollutant for a treatment

technology group, EPA used data from both sampled and DMQ facilities to calculate long-term average concentrations. When only EPA sampling data met the data review criteria, EPA only used data from EPA sampled facilities to calculate long-term average concentrations. When only DMQ data met the data review criteria, EPA did not calculate long-term average concentrations for that pollutant for that treatment technology group because no facilities provided raw waste data. Therefore, EPA could not determine if the pollutant was present in the raw wastewater.

Table 9-1 presents the long-term average concentrations for each pollutant of concern for each of the five postlaundering treatment technology groups. The treatment technology groups listed in Table 9-1 are defined as follows:

- CEB-Heavy represents data from facilities using chemical emulsion breaking of heavy wastewater;
- DAF-Heavy represents data from facilities using DAF of heavy wastewater;
- CP-Heavy represents data from facilities using chemical precipitation of heavy wastewater;
- DAF-All represents data from facilities using DAF of all facility process wastewater; and
- CP-All represents data from facilities using chemical precipitation of all facility process wastewater.

9.5 Long-Term Average Concentrations, Variability Factors, and Standards for the Pollutants Proposed for Regulation

For the 11 pollutants proposed for regulation, EPA calculated long-term averages, variability factors, and standards for the five postlaundering treatment technology groups. As presented in Section 9.4 of this document, long-term averages were calculated using equations derived from an adapted delta-lognormal model that accounts for effluent samples with a pollutant concentration at the detection limit. Variability factors were also calculated using equations from the adapted delta-lognormal model. Standards were calculated as the product of the long-term average and the variability factor. Section 9.4 discusses which data were used to calculate the long-term averages and subsequently the variability factors and standards.

Table 9-1

Overall Long-Term Average (LTA) Concentrations for the Five Postlaundering Treatment Technology Groups for the Pollutants of Concern

Pollutant of Concern	Median LTA (mg/L)				
	CEB-Heavy[1]	DAF-Heavy[2]	CP-Heavy[3]	DAF-All[4]	CP-All[5]
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1040	1310	1390	497	499
Oil and Grease (measured as HEM)	268	230	38.2	37.8	28.5
Total Suspended Solids (TSS)	259	487	56.3	85.5	119
Priority Organics					
1,1,1-Trichloroethane	---	---	---	0.0277	0.471
1,2-Diphenylhydrazine	---	---	45.2	---	---
4-Chloro-3-methylphenol	0.205	---	---	0.220	---
Bis(2-ethylhexyl) Phthalate	0.462	0.852	0.0469	0.144	0.109
Butyl Benzyl Phthalate	---	0.182	0.0100	---	0.0342
Chlorobenzene	---	---	---	0.0280	---
Chloroform	---	---	---	0.185	---
Di-*n*-butyl Phthalate	0.0100	0.647	0.0100	0.125	---
Di-*n*-octyl Phthalate	0.0307	---	---	0.236	0.0342
Ethylbenzene	0.305	1.56	0.0931	0.189	0.269
Isophorone	---	---	---	---	0.297
Methylene Chloride	---	---	---	0.546	---
Naphthalene	0.104	---	0.114	0.0764	0.0583
Phenol	---	---	---	0.211	---
Tetrachloroethene	0.286	---	0.127	0.250	0.259
Toluene	0.543	2.50	0.818	0.711	1.05
trans-1,2-Dichloroethene	---	---	---	---	---
Trichloroethene	---	---	0.0529	---	---
Nonconventional Organics					
2-Butanone	---	4.68	---	17.4	3.23
2-Methylnaphthalene	0.0458	0.129	0.0100	0.116	0.0125
2-Propanone	1.21	7.42	---	13.6	---

Table 9-1 (Continued)

Pollutant of Concern	Median LTA (mg/L)				
	CEB-Heavy[1]	DAF-Heavy[2]	CP-Heavy[3]	DAF-All[4]	CP-All[5]
Nonconventional Organics (Continued)					
4-Methyl-2-pentanone	0.0722	9.55	---	0.595	3.13
∝-Terpineol	0.0100	0.471	---	0.472	---
Benzoic Acid	---	---	---	1.58	---
Benzyl Alcohol	---	---	---	---	---
Hexanoic Acid	0.128	---	---	---	---
m-Xylene	0.366	---	0.104	0.595	0.347
n-Decane	0.279	---	0.0240	0.469	0.104
n-Docosane	0.0347	0.110	0.0120	0.0232	0.0110
n-Dodecane	0.574	---	0.0100	0.195	2.83
n-Eicosane	0.0779	0.373	0.0382	0.0477	0.0167
n-Hexacosane	0.0100	---	0.0122	0.0195	0.0144
n-Hexadecane	0.0417	1.05	0.0315	0.0842	0.0682
n-Octacosane	0.0100	---	0.0100	---	0.0168
n-Octadecane	0.0560	0.422	0.0100	0.0694	0.0309
n-Tetracosane	---	0.125	0.0329	0.0219	0.0107
n-Tetradecane	0.116	0.979	0.612	0.0754	0.0601
n-Triacontane	---	---	0.0341	0.0100	0.0138
o-&*p*-Xylene	0.359	---	0.0940	0.271	0.231
p-Cresol	---	---	---	---	---
p-Cymene	---	0.531	0.0208	0.0700	---
Pentamethylbenzene	---	---	0.0100	---	---
Priority Metals and Elements					
Antimony	0.195	---	---	0.0800	---
Arsenic	---	---	---	---	---
Beryllium	---	---	---	---	---
Cadmium	0.132	---	0.00500	0.0161	0.00691
Chromium	0.153	0.0715	0.0147	0.0695	0.0426
Copper	0.437	1.45	0.534	0.478	0.139
Lead	0.914	0.361	0.0473	0.175	0.100
Mercury	---	---	---	---	---
Nickel	0.255	---	---	0.0544	---

Table 9-1 (Continued)

Pollutant of Concern	Median LTA (mg/L)				
	CEB-Heavy[1]	DAF-Heavy[2]	CP-Heavy[3]	DAF-All[4]	CP-All[5]
Priority Metals and Elements (Continued)					
Selenium	---	---	---	0.0524	---
Silver	---	0.0846	---	---	---
Thallium	---	---	---	---	---
Zinc	6.78	0.903	0.0637	0.837	0.200
Nonconventional Metals and Elements					
Aluminum	6.33	1.34	0.0804	1.31	0.468
Barium	---	0.702	0.145	---	---
Boron	1.64	---	11.4	---	---
Cobalt	---	---	---	---	---
Iron	47.3	19.0	0.366	2.79	4.12
Manganese	0.596	0.884	0.00768	0.0340	0.00877
Molybdenum	0.205	---	0.774	0.119	0.457
Tin	---	---	---	0.0972	---
Titanium	0.0818	0.0927	0.00453	0.0192	0.0179
Vanadium	---	---	---	---	---
Yttrium	---	---	---	---	---
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	2460	3320	2510	998	1080
Total Organic Carbon (TOC)	626	1610	910	326	342
Total Petroleum Hydrocarbon (measured as SGT-HEM)	200	42.1	7.20	13.7	10.8

[1]CEB-Heavy represents data from facilities using chemical emulsion breaking treatment of heavy wastewater.
[2]DAF-Heavy represents data from facilities using DAF treatment of heavy wastewater.
[3]CP-Heavy represents data from facilities using chemical precipitation treatment of heavy wastewater.
[4]DAF-All represents data from facilities using DAF treatment of all facility process wastewater.
[5]CP-All represents data from facilities using chemical precipitation treatment of all facility process wastewater.
HEM-Hexane Extractable Material.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

The following tables present the overall and episode long-term averages, variability factors, and standards for the five postlaundering treatment technology groups for the 11 pollutants proposed for regulation:

- Table 9-2 presents the long-term averages and variability factors for chemical emulsion breaking treatment of heavy wastewater for each pollutant proposed for regulation by episode;
- Table 9-3 presents the median of the episode long-term averages, variability factors, and standards for chemical emulsion breaking treatment of heavy wastewater for each pollutant proposed for regulation;
- Table 9-4 presents the long-term averages and variability factors for DAF treatment of heavy wastewater for each pollutant proposed for regulation by episode;
- Table 9-5 presents the median of the episode long-term averages, variability factors, and standards for DAF treatment of heavy wastewater for each pollutant proposed for regulation;
- Table 9-6 presents the long-term averages and variability factors for chemical precipitation treatment of heavy wastewater for each pollutant proposed for regulation by episode;
- Table 9-7 presents the median of the episode long-term averages, variability factors, and standards for chemical precipitation treatment of heavy wastewater for each pollutant proposed for regulation;
- Table 9-8 presents the long-term averages and variability factors for DAF treatment of all facility process wastewater for each pollutant proposed for regulation by episode;
- Table 9-9 presents the median of the episode long-term averages, variability factors, and standards for DAF treatment of all facility process wastewater for each pollutant proposed for regulation;
- Table 9-10 presents the long-term averages and variability factors for chemical precipitation treatment of all facility process wastewater for each pollutant proposed for regulation by episode; and
- Table 9-11 presents the median of the episode long-term averages, variability factors, and standards for chemical precipitation treatment of all facility process wastewater for each pollutant proposed for regulation.

Table 9-2

Episode Long-Term Average (LTA) Concentrations and Variability Factors (VF) for Chemical Emulsion Breaking Treatment of Heavy Wastewater for the Pollutants Proposed for Regulation

Regulated Pollutant	Site Number[1]	LTA (mg/L)	1-Day VF[2] (mg/L)	4-Day VF[3] (mg/L)
Priority Organics				
Bis(2-ethylhexyl) Phthalate	S1	0.462	3.67	NA
Ethylbenzene	S1	0.305	4.74	NA
Naphthalene	S1	0.104	1.82	NA
Tetrachloroethene	S1	0.286	2.91	NA
Toluene	S1	0.543	1.79	NA
Nonconventional Organics				
m-Xylene	S1	0.366	1.61	NA
o-&*p*-Xylene	S1	0.359	1.72	NA
Priority Metals and Elements				
Copper	S1	0.437	1.76	NA
Lead	S1	0.914	1.32	NA
Zinc	S1	6.78	1.33	NA
Bulk Nonconventionals				
Total Petroleum Hydrocarbon (measured as SGT-HEM)	S1	200	3.51	1.64

[1]Facilities with a site number beginning with "S" were sampled by EPA. Facilities with a site number beginning with "Q" provided data in their detailed monitoring questionnaire.
[2]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[3]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-3

Summary of Long-Term Averages (LTA), Variability Factors (VF), and Standards for Chemical Emulsion Breaking Treatment of Heavy Wastewater

Pollutant	# of Sites	Median LTA (mg/L)	1-Day VF[1] (mg/L)	Daily Maximum Standard (mg/L)	4-Day VF[2] (mg/L)	4-Day Monthly Average Standard (mg/L)
Priority Organics						
Bis(2-ethylhexyl) Phthalate	1	0.462	3.67	1.70	NA	NA
Ethylbenzene	1	0.305	4.74	1.45	NA	NA
Naphthalene	1	0.104	1.82	0.190	NA	NA
Tetrachloroethene	1	0.286	2.91	0.833	NA	NA
Toluene	1	0.543	1.79	0.973	NA	NA
Nonconventional Organics						
m-Xylene	1	0.366	1.61	0.590	NA	NA
o-&*p*-Xylene	1	0.359	1.72	0.619	NA	NA
Priority Metals and Elements						
Copper	1	0.437	1.76	0.772	NA	NA
Lead	1	0.914	1.32	1.20	NA	NA
Zinc	1	6.78	1.33	9.04	NA	NA
Bulk Nonconventionals						
Total Petroleum Hydrocarbon (measured as SGT-HEM)	1	200	3.51	703	1.64	328

[1]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[2]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-4

Episode Long-Term Average (LTA) Concentrations and Variability Factors (VF) for DAF Treatment of Heavy Wastewater for Pollutants Proposed for Regulation[1]

Pollutant	Site Number[2]	LTA (mg/L)	1-Day VF[3] (mg/L)	4-Day VF[4] (mg/L)
Priority Organics				
Bis(2-ethylhexyl) Phthalate	S2	0.852	NC	NA
Ethylbenzene	S2	1.56	2.86	NA
Toluene	S2	2.50	1.96	NA
Priority Metals and Elements				
Copper	S2	1.45	1.90	NA
Lead	S2	0.361	6.18	NA
Zinc	S2	0.903	2.68	NA
Bulk Nonconventionals				
Total Petroleum Hydrocarbon (measured as SGT-HEM)	S2	42.1	2.31	1.37

[1]Insufficient data were available to calculate long-term average pollutant concentrations for all of the pollutants proposed for regulation at each site. This table only includes pollutants proposed for regulation at sites for which a long-term average could be calculated.
[2]Facilities with a site number beginning with "S" were sampled by EPA. Facilities with a site number beginning with "Q" provided data in their detailed monitoring questionnaire.
[3]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[4]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-5

Summary of Long-Term Averages (LTA), Variability Factors (VF), and Standards for DAF Treatment of Heavy Wastewater[1]

Pollutant	# of Sites	Median LTA (mg/L)	1-Day VF[2] (mg/L)	Daily Maximum Standard (mg/L)	4-Day VF[3] (mg/L)	4-Day Monthly Average Standard (mg/L)
Priority Organics						
Bis(2-ethylhexyl) Phthalate	1	0.852	NC	NC	NA	NA
Ethylbenzene	1	1.56	2.86	4.47	NA	NA
Toluene	1	2.50	1.96	4.90	NA	NA
Priority Metals and Elements						
Copper	1	1.45	1.90	2.76	NA	NA
Lead	1	0.361	6.18	2.23	NA	NA
Zinc	1	0.903	2.68	2.42	NA	NA
Bulk Nonconventionals						
Total Petroleum Hydrocarbon (measured as SGT-HEM)	1	42.1	2.31	97.4	1.37	57.6

[1]This table does not include all pollutants proposed for regulation. For the pollutants proposed for regulation but not included in this table, no sites made available sufficient data to calculate a long-term average pollutant concentrations.
[2]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[3]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-6

Episode Long-Term Average (LTA) Concentrations and Variability Factors (VF) for Chemical Precipitation Treatment of Heavy Wastewater for the Pollutants Proposed for Regulation

Pollutant	Site Number[1]	LTA (mg/L)	1-Day VF[2] (mg/L)	4-Day VF[3] (mg/L)
Priority Organics				
Bis(2-ethylhexyl) Phthalate	S3	0.0469	NC	NA
Ethylbenzene	S3	0.0931	4.37	NA
Naphthalene	S3	0.114	3.14	NA
Tetrachloroethene	S3	0.127	4.48	NA
Toluene	S3	0.818	6.79	NA
Nonconventional Organics				
m-Xylene	S3	0.104	2.66	NA
o-&*p*-Xylene	S3	0.0940	3.63	NA
Priority Metals and Elements				
Copper	S3	0.534	4.06	NA
Lead	S3	0.0473	NC	NA
Zinc	S3	0.0637	6.19	NA
Bulk Nonconventionals				
Total Petroleum Hydrocarbon (measured as SGT-HEM)	S3	7.20	NC	NC

[1]Facilities with a site number beginning with "S" were sampled by EPA. Facilities with a site number beginning with "Q" provided data in their detailed monitoring questionnaire.
[2]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[3]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-7

Summary of Long-Term Averages (LTA), Variability Factors (VF), and Standards for Chemical Precipitation Treatment of Heavy Wastewater

Pollutant	# of Sites	Median LTA (mg/L)	1-Day VF[1] (mg/L)	Daily Maximum Standard (mg/L)	4-Day VF[2] (mg/L)	4-Day Monthly Average Standard (mg/L)
Priority Organics						
Bis(2-ethylhexyl) Phthalate	1	0.0469	NC	NC	NA	NA
Ethylbenzene	1	0.0931	4.37	0.407	NA	NA
Naphthalene	1	0.114	3.14	0.357	NA	NA
Tetrachloroethene	1	0.127	4.48	0.567	NA	NA
Toluene	1	0.818	6.79	5.55	NA	NA
Nonconventional Organics						
m-Xylene	1	0.104	2.66	0.276	NA	NA
o-&*p*-Xylene	1	0.0940	3.63	0.342	NA	NA
Priority Metals and Elements						
Copper	1	0.534	4.06	2.17	NA	NA
Lead	1	0.0473	NC	NC	NA	NA
Zinc	1	0.0637	6.19	0.395	NA	NA
Bulk Nonconventionals						
Total Petroleum Hydrocarbon (measured as SGT-HEM)	1	7.20	NC	NC	NC	NC

[1]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[2]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-8

Episode Long-Term Average (LTA) Concentrations and Variability Factors (VF) for DAF Treatment of All Facility Process Wastewater for the Pollutants Proposed for Regulation[1]

Pollutant	Site Number[2]	LTA (mg/L)	1-Day VF[3] (mg/L)	4-Day VF[4] (mg/L)
Priority Organics				
Bis(2-ethylhexyl) Phthalate	Q1	0.421	3.43	NA
	S4	0.0334	2.73	NA
	S5	0.144	3.06	NA
Ethylbenzene	Q2	0.00438	3.54	NA
	S5	0.374	4.16	NA
Naphthalene	Q2	0.00304	NC	NA
	S4	0.0764	4.73	NA
	S5	0.180	1.57	NA
Tetrachloroethene	Q2	0.0239	4.97	NA
	Q1	25.1	15.4	NA
	S4	0.0656	3.08	NA
	S5	0.434	5.87	NA
Toluene	Q2	0.0473	13.5	NA
	S4	0.711	7.93	NA
	S5	4.20	2.80	NA
Nonconventional Organics				
m-Xylene	S5	0.595	3.55	NA
o-&*p*-Xylene	S4	0.117	3.15	NA
	S5	0.424	4.07	NA
Priority Metals and Elements				
Copper	Q4	0.387	3.15	NA
	Q3	0.569	6.95	NA
	Q2	0.593	4.52	NA
	Q1	0.668	6.40	NA
	S5	0.173	1.59	NA
	S4	0.360	3.07	NA
Lead	Q4	0.100	NC	NA
	Q1	0.215	5.05	NA
	Q2	0.233	2.99	NA
	Q3	0.320	1.55	NA
	S5	0.0553	1.39	NA
	S4	0.135	3.72	NA

Table 9-8 (Continued)

Pollutant	Site Number[2]	LTA (mg/L)	1-Day VF[3] (mg/L)	4-Day VF[4] (mg/L)
Priority Metals and Elements (Continued)				
Zinc	Q4	0.778	2.96	NA
	Q1	0.897	7.34	NA
	Q3	0.911	6.27	NA
	Q2	1.22	5.11	NA
	S5	0.268	1.58	NA
	S4	0.513	3.17	NA
Bulk Nonconventionals				
Total Petroleum Hydrocarbon (measured as SGT-HEM)	S4	11.4	3.64	1.68
	S5	16.0	2.62	1.44

[1]Insufficient data were available to calculate long-term average pollutant concentrations for all of the pollutants proposed for regulation at each site. This table only includes pollutants proposed for regulation at sites for which a long-term average could be calculated.
[2]Facilities with a site number beginning with "S" were sampled by EPA. Facilities with a site number beginning with "Q" provided data in their detailed monitoring questionnaire.
[3]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[4]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-9

Summary of Long-Term Averages (LTV), Variability Factors (VF), and Standards for DAF Treatment of All Facility Process Wastewater

Pollutant	# of Sites	Median LTA (mg/L)	1-Day VF[1] (mg/L)	Daily Maximum Standard (mg/L)	4-Day VF[2] (mg/L)	4-Day Monthly Average Standard (mg/L)
Priority Organics						
Bis(2-ethylhexyl) Phthalate	3	0.144	3.06	0.443	NA	NA
Ethylbenzene	2	0.189	3.85	0.727	NA	NA
Naphthalene	3	0.0764	3.15	0.241	NA	NA
Tetrachloroethene	4	0.250	5.42	1.35	NA	NA
Toluene	3	0.711	7.93	5.63	NA	NA
Nonconventional Organics						
m-Xylene	1	0.595	3.55	2.11	NA	NA
o-&*p*-Xylene	2	0.271	3.61	0.976	NA	NA
Priority Metals and Elements						
Copper	6	0.478	3.83	1.83	NA	NA
Lead	6	0.175	2.99	0.524	NA	NA
Zinc	6	0.837	4.14	3.47	NA	NA
Bulk Nonconventionals						
Total Petroleum Hydrocarbon (measured as SGT-HEM)	2	13.7	3.13	42.9	1.56	21.3

[1]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[2]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-10

Episode Long-Term Average (LTA) Concentrations and Variability Factors (VF) for Chemical Precipitation Treatment of All Facility Process Wastewater for the Pollutants Proposed for Regulation[1]

Pollutant	Site Number[2]	LTA (mg/L)	1-Day VF[3] (mg/L)	4-Day VF[4] (mg/L)
Priority Organics				
Bis(2-ethylhexyl) Phthalate	Q7	0.148	NC	NA
	S6	0.0691	1.21	NA
Ethylbenzene	Q7	0.0360	NC	NA
	Q9	0.343	9.68	NA
	S6	0.269	2.47	NA
Naphthalene	Q6	0.0582	NC	NA
	Q7	0.0583	NC	NA
	S6	0.0768	3.90	NA
Tetrachloroethene	Q9	0.0795	7.56	NA
	S6	0.438	5.65	NA
Toluene	Q7	0.0370	NC	NA
	Q9	1.05	2.86	NA
	S6	1.58	2.39	NA
Nonconventional Organics				
m-Xylene	S6	0.347	3.84	NA
o-&*p*-Xylene	S6	0.231	4.12	NA
Priority Metals and Elements				
Copper	Q5	0.139	1.71	NA
	Q6	0.400	1.56	NA
	S6	0.0563	3.57	NA
Lead	Q7	0.0264	3.89	NA
	Q5	0.100	1.29	NA
	Q8	0.195	2.66	NA
	Q6	0.279	1.52	NA
	S6	0.0619	5.29	NA
Zinc	Q5	0.0968	3.96	NA
	Q8	0.303	6.94	NA
	Q6	1.72	2.14	NA
	S6	0.0547	1.79	NA

Table 9-10 (Continued)

Pollutant	Site Number[2]	LTA (mg/L)	1-Day VF[3] (mg/L)	4-Day VF[4] (mg/L)
Bulk Nonconventionals				
Total Petroleum Hydrocarbon (measured as SGT-HEM)	S6	10.8	2.54	1.42

[1]Insufficient data were available to calculate long-term average pollutant concentrations for all of the pollutants proposed for regulation at each site. This table only includes pollutants proposed for regulation at sites for which a long-term average could be calculated.
[2]Facilities with a site number beginning with "S" were sampled by EPA. Facilities with a site number beginning with "Q" provided data in their detailed monitoring questionnaire.
[3]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[4]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
NC - Not calculated. Insufficient data were available to calculate this variability factor. Four values, at least two of which must be detected, are necessary to calculate a variability factor.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

Table 9-11

Summary of Long-Term Averages (LTA), Variability Factors (VF), and Standards for Chemical Precipitation Treatment of All Facility Process Wastewater

Pollutant	# of Sites	Median LTA (mg/L)	1-Day VF[1] (mg/L)	Daily Maximum Standard (mg/L)	4-Day VF[2] (mg/L)	4-Day Monthly Average Standard (mg/L)
Priority Organics						
Bis(2-ethylhexyl) Phthalate	2	0.109	1.21	0.132	NA	NA
Ethylbenzene	3	0.269	6.08	1.64	NA	NA
Naphthalene	3	0.0583	3.90	0.228	NA	NA
Tetrachloroethene	2	0.259	6.61	1.71	NA	NA
Toluene	3	1.05	2.63	2.76	NA	NA
Nonconventional Organics						
m-Xylene	1	0.347	3.84	1.33	NA	NA
o-&*p*-Xylene	1	0.231	4.12	0.952	NA	NA
Priority Metals and Elements						
Copper	3	0.139	1.71	0.238	NA	NA
Lead	5	0.100	2.66	0.266	NA	NA
Zinc	4	0.200	3.05	0.610	NA	NA
Bulk Nonconventionals						
Total Petroleum Hydrocarbon (measured as SGT-HEM)	1	10.8	2.54	27.5	1.42	15.4

[1]The 1-day VF is defined as the daily variability of pollutant concentrations. EPA used the 1-day VF to calculate daily maximum standards for all pollutants proposed for regulation.
[2]The 4-day variability factor is defined as the monthly variability of pollutant concentrations based on 4 days of sampling per month. EPA used the 4-day VF to calculate a monthly average standard for total petroleum hydrocarbon.
NA - Not analyzed. EPA did not use the 4-day VF to calculate standards for these pollutants.
SGT-HEM - Silica Gel Treated-Hexane Extractable Material.

9.6 Identification of Data Used to Calculate the Long-Term Average Concentrations for the Prelaundering Technology Group

One of the sampled facilities steam-tumbled printer towels/rags before water-washing them. Steam tumbling is designed to remove organic pollutants from laundry items. Therefore, this treatment technology is not expected to demonstrate pollutant removals for all 72 pollutants of concern. This section presents EPA's methodology used to identify pollutants effectively removed by steam tumbling and to calculate target effluent concentrations for these pollutants.

EPA collected samples of wastewater discharge after processing a load of printer towels/rags that was steam-tumbled before water washing and from a load of printer towels/rags that was not steam-tumbled before water washing. Because both loads contained the same item and because both loads did not contain any free-standing liquids (this facility does not accept printer towels/rags containing free-standing liquids), EPA considered the untreated pollutant loadings from both loads to be equivalent. The raw wastewater samples from the load that was not steam-tumbled were used to represent the untreated influent to the steam-tumbling unit, and the effluent wastewater samples from the steam-tumbled load were used to demonstrate the changes in the untreated wastewater characteristics from steam tumbling. EPA used these data to identify pollutants effectively removed by steam tumbling and to calculate target effluent concentrations for the pollutants removed by steam tumbling.

EPA used these samples to identify pollutants removed by steam tumbling by comparing the untreated influent and the effluent wastewater samples used to demonstrate changes in the untreated wastewater characteristics from steam tumbling. All volatile organic pollutants for which a removal could be calculated (pollutant removals for 7 volatile organics could not be calculated because the pollutant was not detected in the influent) had greater than 90 percent removal. Therefore, EPA considered organic pollutants with greater than 90 percent removal to be removed by steam tumbling. Based on this criterion, EPA considered all volatile organic pollutants (14 of the 72 pollutants of concern) to be removed by steam tumbling. Ten semivolatile organic pollutants from the list of 72 pollutants of concern for which a removal could be calculated (pollutant removals for 8 semivolatile organic pollutants could not be calculated because the pollutant was not detected in the influent) also had greater than 90 percent removal. EPA considered these 10 semivolatile organic pollutants to be removed by steam tumbling.

Based on this analysis, EPA considered 24 organic pollutants from the list of 72 pollutants of concern to be removed by steam tumbling. Based on EPA analysis and vendor data, EPA determined that shop towels, printer towels/rags, mops, filters, and fender covers would be steam-tumbled in this option. These untreated items typically contain the highest concentrations of pollutants of all items laundered at industrial laundries. EPA determined that steam tumbling items other than shop towels, printer towels/rags, mops, filters, and fender covers does not result in significant pollutant removals because these items do not typically contain high concentrations of organic pollutants.

EPA then identified target effluent concentrations for steam tumbling of shop towels, printer towels/rags, mops, filters, and fender covers for the 24 pollutants effectively removed by steam tumbling. For some of the 24 pollutants, the pollutant concentration on items not treated by steam tumbling (garments, mats, and linen items) was higher than the pollutant concentration for steam tumbling of printer towels/rags. In these cases, EPA selected the highest pollutant concentration from garments, mats, and linen items as the target effluent concentration for that pollutant. Table 9-12 presents the target effluent concentrations for steam tumbling for the 24 organic pollutants effectively removed.

9.7 Mass-Based Standards

EPA considered proposing mass-based standards for the industrial laundry industry. A mass-based standard is the product of the concentration-based standards and a wastewater flow rate divided by a production rate. Mass-based standards require information about flow and production both to set the standards and to enforce them, but have the advantage of encouraging flow reduction. Two methodologies were considered for developing mass-based standards. One methodology bases the mass-based standards on an average number of gallons of wastewater discharged per pound of laundry washed for the total wastewater flow and total production from facilities. The other methodology bases the standards on an average number of gallons of water used per pound of laundry washed calculated from individual item data. EPA used annual data provided in the detailed questionnaire to evaluate these approaches. EPA determined that basing the mass-based standards on total wastewater flow and total production data is more appropriate than basing the standards on individual item data. Based on total wastewater flow and total production, EPA identified the seventy-fifth percentile and the ninetieth percentile production-normalized flows as potentially appropriate for calculating mass-based standards. The seventy-fifth percentile production-normalized flow is 3.13 gallons of wastewater per pound of production and the ninetieth percentile production normalized flow is 4.06 gallons of wastewater per pound of production.

9.8 References

1. U.S. Environmental Protection Agency. Statistical Support Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA 821-R-97-006, Washington, DC, November 1997.

Table 9-12

Target Effluent Concentrations for Steam Tumbling of Heavy Items Before Water Washing for the Pollutants of Concern

Pollutant of Concern	Median LTA (mg/L)
Priority Organics	
1,1,1-Trichloroethane	1.60
Butyl Benzyl Phthalate	0.366
Chlorobenzene	0.0550
Chloroform	0.889
Ethylbenzene	0.283
Methylene Chloride	0.442
Naphthalene	0.226
Tetrachloroethene	0.125
Toluene	1.29
trans-1,2-Dichloroethene	0.0550
Trichloroethene	0.0550
Nonconventional Organics	
2-Butanone	0.579
2-Methylnaphthalene	0.0550
2-Propanone	2.11
4-Methyl-2-pentanone	0.500
∝-terpineol	0.0830
m-Xylene	0.520
n-Decane	2.63
n-Dodecane	2.65
n-Hexacosane	0.130
n-Octacosane	0.0960
n-Triacontane	0.0620
o-&*p*-Xylene	0.291
p-Cymene	0.108

CHAPTER 10

DEVELOPMENT OF REGULATORY OPTIONS

10.1 Introduction

This chapter presents the regulatory options considered by EPA as the basis for the proposed Pretreatment Standards for Existing Sources (PSES) and Pretreatment Standards for New Sources (PSNS) for the industrial laundries industry. This chapter presents the following information:

- Section 10.2 presents the regulatory options considered as the basis for the proposed PSES;
- Section 10.3 presents the regulatory options considered as the basis for the proposed PSNS; and
- Section 10.4 presents the references used.

10.2 Pretreatment Standards for Existing Sources (PSES)

Pretreatment standards for existing sources establish quantitative limits on the indirect discharge of priority and nonconventional pollutants to waters of the United States (i.e., PSES limit industrial discharges to publicly owned treatment works (POTWs)). PSES are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. The Clean Water Act (CWA) requires pretreatment for pollutants that pass through POTWs in amounts that would exceed direct discharge effluent standards or limit POTW sludge management alternatives, including the beneficial use of sludges on agricultural lands. These limits are based upon the performance of specific technologies, but they do not require the use of any specific technology. PSES are applied to individual facilities and are administered by local permitting authorities (i.e., the government entity controlling the POTW to which the industrial wastewater is discharged). The facility then chooses its own approach to complying with its permit standards.

EPA considered 17 technology options as potential bases for PSES. These options are presented in Sections 10.2.1 and 10.2.2 below.

10.2.1 Initial Technology Options Considered

As described in Chapter 9, EPA had data available for five major postlaundering wastewater treatment technologies and one prelaundering treatment technology used by industrial laundries. These formed the basis for EPA's six initial technology options. The following sections further discuss each of these initial technology options. Table 10-1 summarizes the

Table 10-1

Technology Options Initially Considered for the Industrial Laundries Proposed Rule

Regulatory Option	Description	Basis of Standards	Number of Facilities with Equivalent or Better Treatment In Place[1]
CEB-Heavy	Chemical emulsion breaking of heavy wastewater.	CEB-Heavy	5
DAF-Heavy	Dissolved air flotation of heavy wastewater.	DAF-Heavy	1
CP-Heavy	Chemical precipitation of heavy wastewater.	CP-Heavy	7[2]
DAF-All	Dissolved air flotation of all facility process wastewater.	DAF-All	33
CP-All	Chemical precipitation of all facility process wastewater.	CP-All	17[3]
OC-Only	Organics control (steam tumbling) of heavy industrial laundry items.	OC-Only	0[4]

[1]Data obtained from 193 in-scope facilities that responded to the detailed questionnaire. In-scope facilities are those that meet the definition of an industrial laundry as presented in Chapter 6, regardless of annual production.
[2]One of these facilities operates a microfiltration unit to treat a portion of its process wastewater. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation (1), this facility is considered to have better treatment in place than the CP-Heavy option.
[3]One of these facilities operates an ultrafiltration unit to treat all of its process wastewater. Since ultrafiltration can achieve lower final effluent concentrations than chemical precipitation (1), this facility is considered to have better treatment in place than the CP-All option.
[4]Data from one facility were used to develop target average concentrations for OC-Only, but this facility steam tumbles printer towels only, not all heavy industrial items.

six initial technology options and the number of detailed questionnaire facilities that have equivalent or better treatment currently in place.

Postlaundering Wastewater Treatment Technology Options

The five initial postlaundering wastewater treatment technology options considered by EPA are:

- CEB-Heavy -- chemical emulsion breaking treatment of heavy wastewater;
- DAF-Heavy -- dissolved air flotation (DAF) treatment of heavy wastewater;
- CP-Heavy -- chemical precipitation treatment of heavy wastewater;
- DAF-All -- DAF treatment of all facility process wastewater; and
- CP-All -- chemical precipitation treatment of all facility process wastewater.

The treatment train for each of the postlaundering wastewater treatment technology options includes the major wastewater treatment technology (i.e., chemical emulsion breaking, DAF, or chemical precipitation), as well as other ancillary equipment. Based on responses to the detailed questionnaire and EPA site visits to industrial laundries, it was assumed that every facility has an initial catch basin in which gravity settling occurs. Each option includes screening and equalization followed by the major wastewater treatment technology. Although they do not directly impact final effluent concentrations, screening and equalization are included in the technology options because they are necessary to remove solids and control fluctuations in the process wastewater flow, respectively. They were also reported in the detailed questionnaire by most facilities that currently treat their wastewater. Based on information obtained through site visits, it was determined that these units facilitate the operation of subsequent treatment units. The options in which DAF and chemical precipitation are used also include dewatering of the sludge generated.

Based on detailed questionnaire and sampling data from industrial laundries that use chemical emulsion breaking and chemical precipitation, as well as information on facilities' local discharge limits, it is expected that the pH of the treated wastewater streams from these technologies will be outside of facilities' locally permitted discharge range. Therefore, the CEB and chemical precipitation options also include pH adjustment of the final effluent prior to discharge. For technology options in which a portion of the facility's wastewater is treated with chemical emulsion breaking or chemical precipitation, combination of the treated and untreated streams prior to final pH adjustment and discharge is also included. The effluent from DAF is expected to be within facilities' locally permitted discharge range for pH, based on detailed questionnaire and sampling data. Therefore, the DAF treatment options do not include pH

adjustment. For technology options in which a portion of the facility's wastewater is treated with DAF, combination of the treated and untreated streams prior to discharge is included.

The five initial wastewater treatment technology options treat either the wastewater generated from washing "heavy" industrial laundry items only (i.e., those items with a relatively high pollutant load) or the total facility process wastewater. EPA modeled the raw wastewater treated in each of these options by considering the total raw wastewater flow reported by each facility in the detailed questionnaire to consist of three streams, as follows:

- Heavy industrial;
- Light industrial; and
- Linen.

The heavy industrial stream includes wastewater generated from water washing the following items:

- Shop towels;
- Printer towels;
- Mops;
- Fender covers; and
- Filters.

The light industrial stream includes wastewater generated from water washing the following items:

- Industrial Garments;
- Floor Mats;
- Clean Room Garments;
- Laundry Bags; and
- Buffing Pads;

and wastewater generated from dry cleaning followed by water washing or dual phase washing of the following items:

- Industrial Garments;
- Shop towels;
- Printer towels;
- Mats;
- Mops;
- Fender covers;
- Clean Room Garments;
- Laundry Bags;
- Filters; and
- Buffing Pads.

The linen stream includes wastewater generated from water washing or denim prewashing the following items (dry cleaning followed by water washing and dual phase washing were not reported for linen items):

- Linen Supply Garments;
- Linen Flatwork/Full Dry;
- Health-Care Items;
- Continuous Roll Towels;
- Family Laundry;
- New Items;
- Executive Wear; and
- Miscellaneous Not Our Goods.

The wastewater generated from the washing of heavy industrial items ("heavy" wastewater) contains higher concentrations of most pollutants than the wastewater generated from the washing of light industrial and linen items ("light" wastewater). Figures 10-1, 10-2, and 10-3 illustrate the CEB-Heavy, DAF-Heavy, and CP-Heavy technology options, respectively. The All options treat the total facility process wastewater. Figures 10-4 and 10-5 illustrate the DAF-All and CP-All technology options, respectively.

EPA obtained specific performance data on the treatment of heavy industrial laundry wastewater through wastewater sampling at industrial laundries, as discussed in Chapter 9. The standards for the Heavy options would be based on pollutant concentrations obtained from the treated heavy wastewater, prior to combining with the light wastewater stream, as shown in Figures 10-1, 10-2, and 10-3. The standards for the All options would be based on pollutant concentrations obtained at the point of discharge from treatment of the entire wastewater stream as shown in Figures 10-4 and 10-5.

Prelaundering Organics Control (OC-Only) Technology Option

The OC-Only option, shown in Figure 10-6, consists of steam tumbling treatment of facilities' heavy industrial laundry items to remove organics prior to water washing of the items. EPA obtained specific performance data from one facility on the steam tumbling of printer towels, as discussed in Chapter 9. The standards for the OC-Only option would be based on pollutant concentrations obtained from the raw wastewater discharged from a load of steam tumbled printer towels, as shown in Figure 10-6.

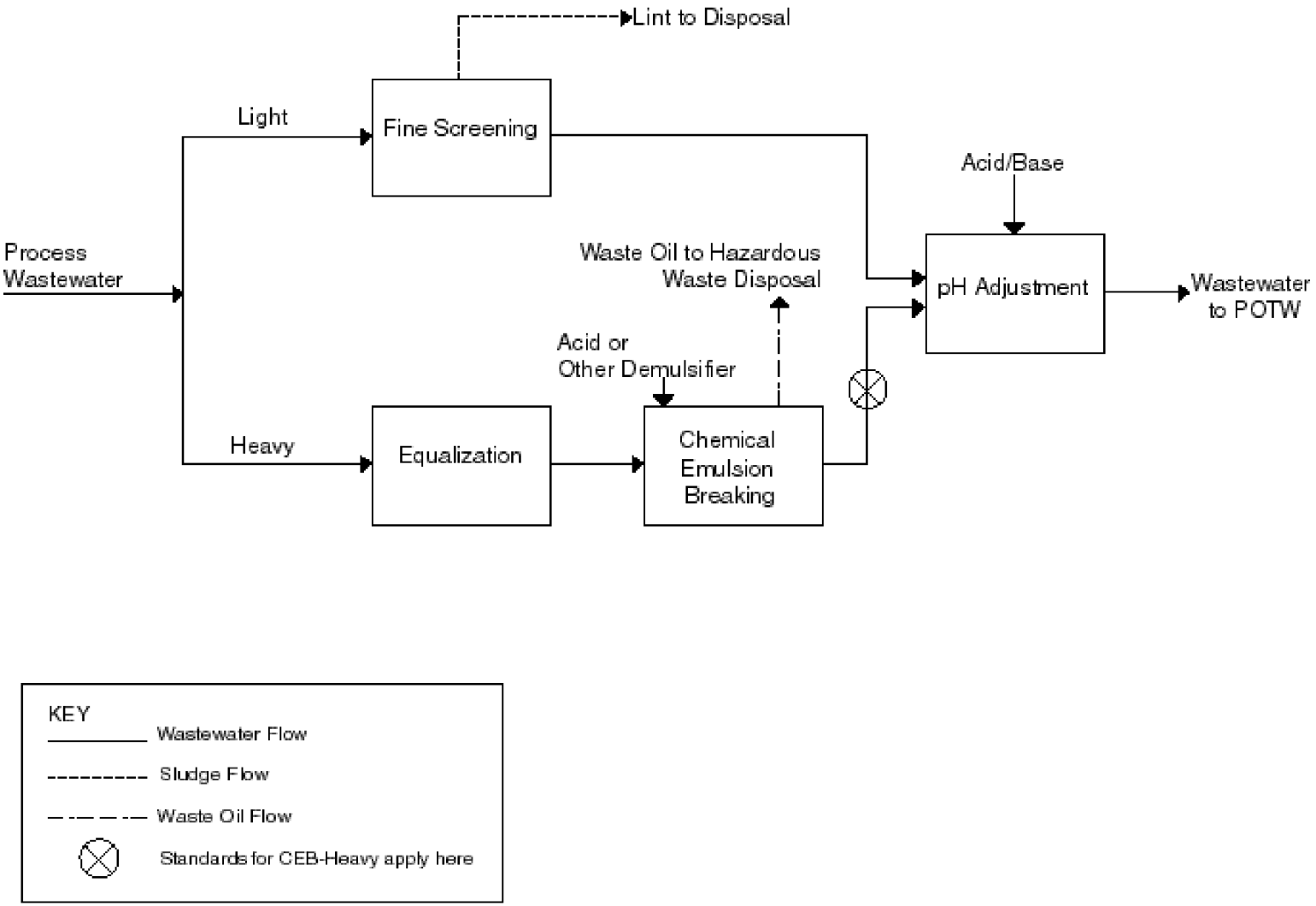

Figure 10-1. CEB-Heavy Option: Chemical Emulsion Breaking of Heavy Industrial Laundry Wastewater

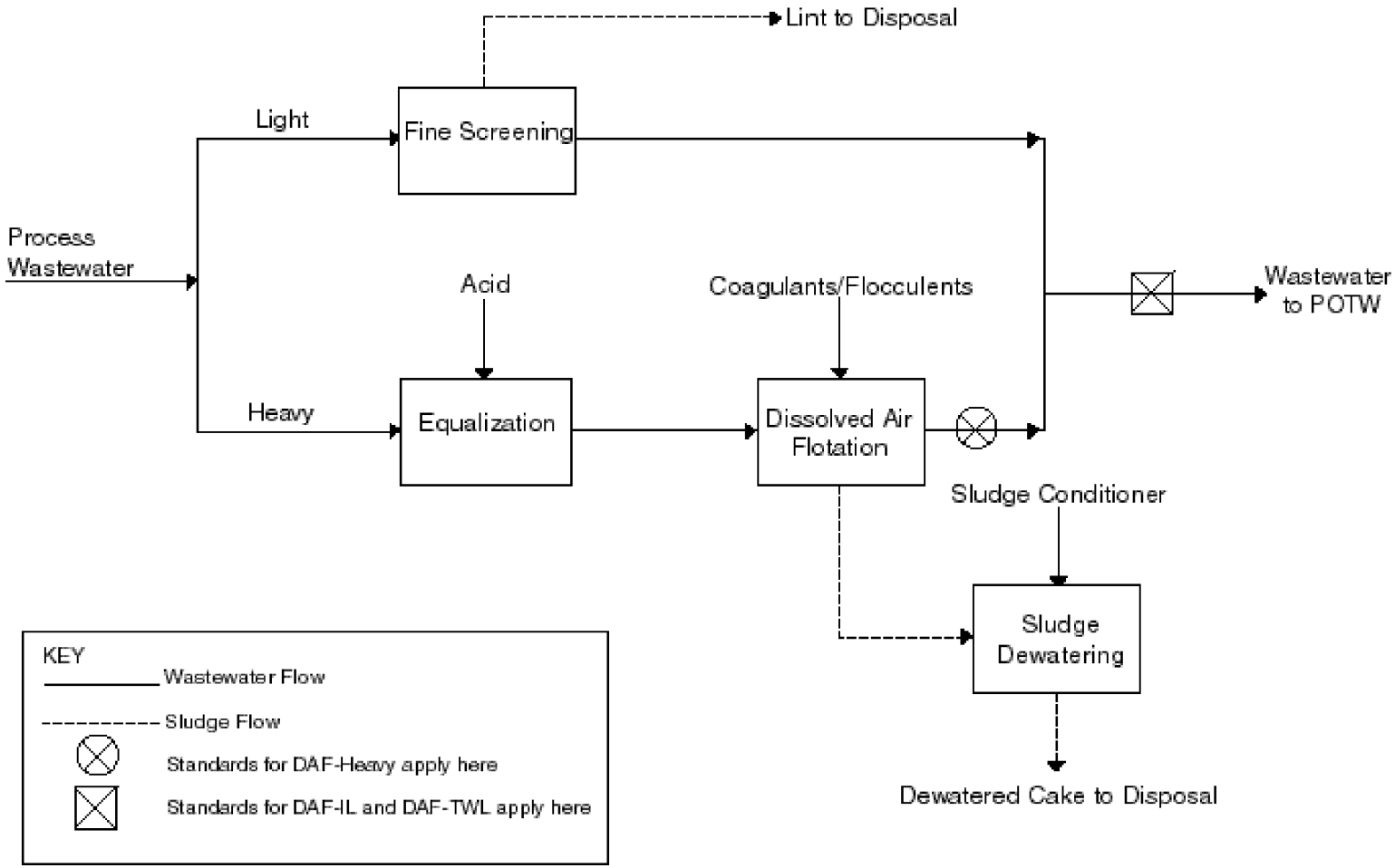

Figure 10-2. DAF-Heavy, DAF-IL, and DAF-TWL Options: Dissolved Air Flotation of a Portion of a Facility's Process Wastewater

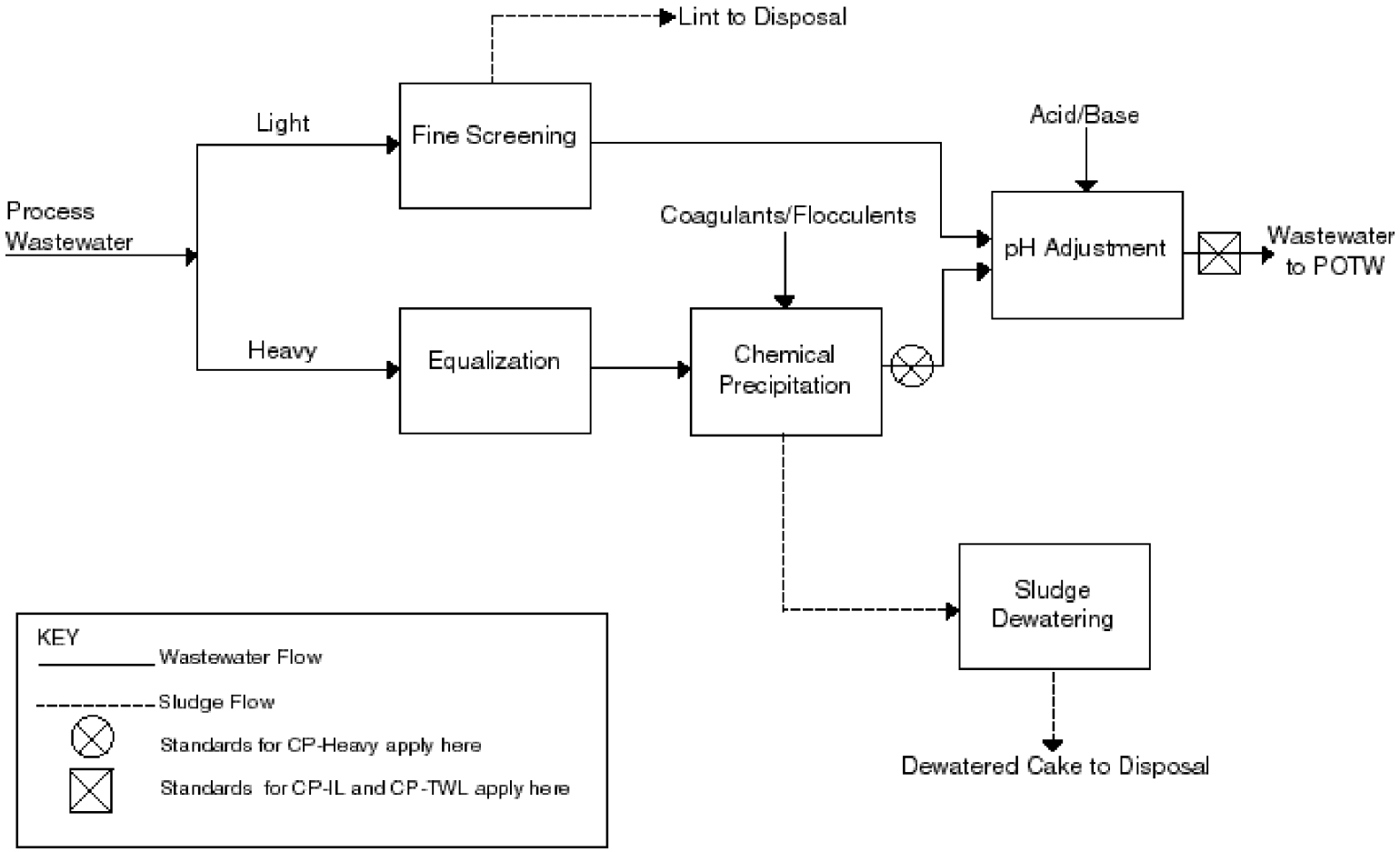

Figure 10-3. CP-Heavy, CP-IL, and CP-TWL Options: Chemical Precipitation of a Portion of a Facility's Process Wastewater

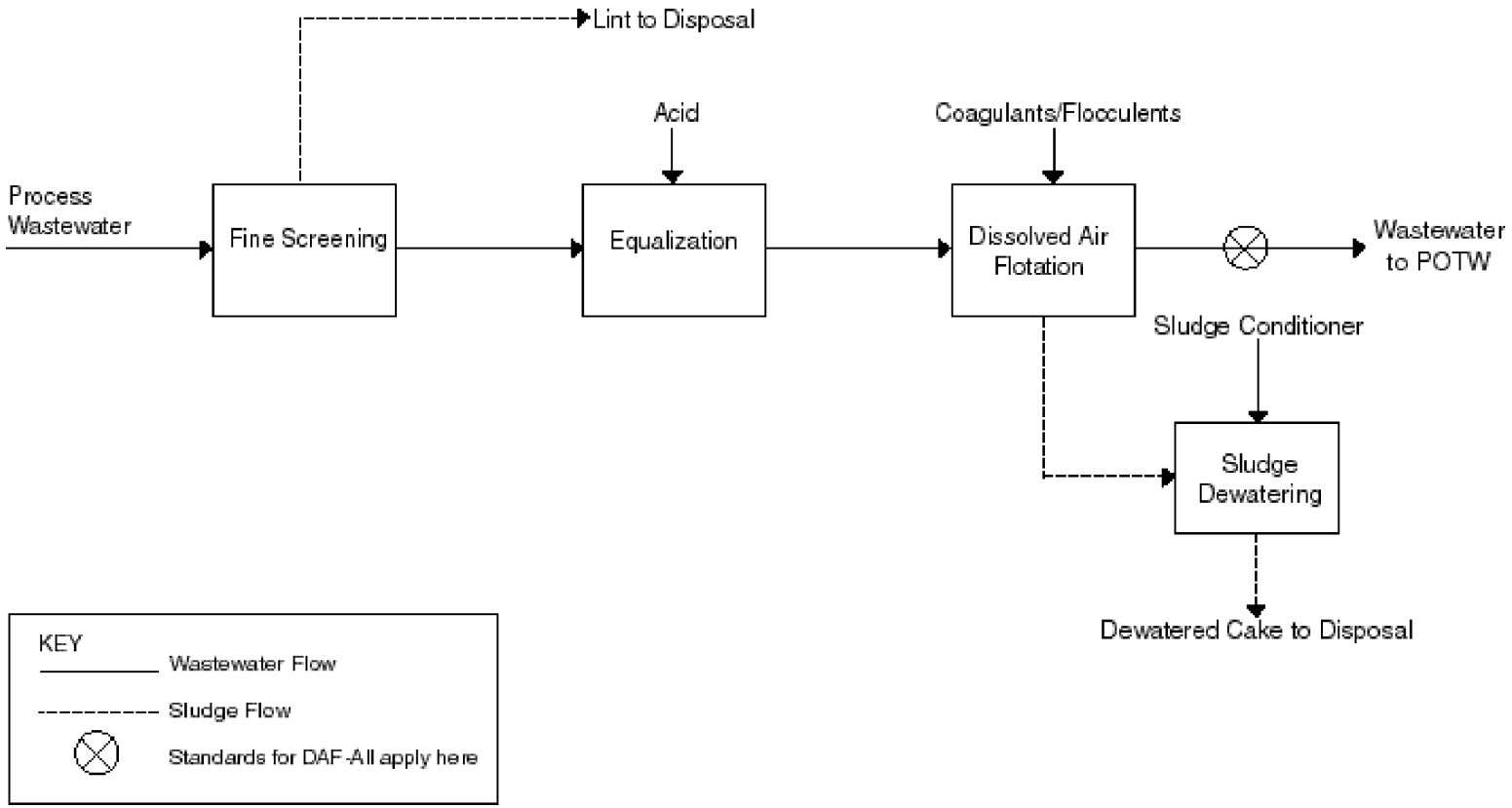

Figure 10-4. DAF-All Option: Dissolved Air Flotation of Total Facility Process Wastewater

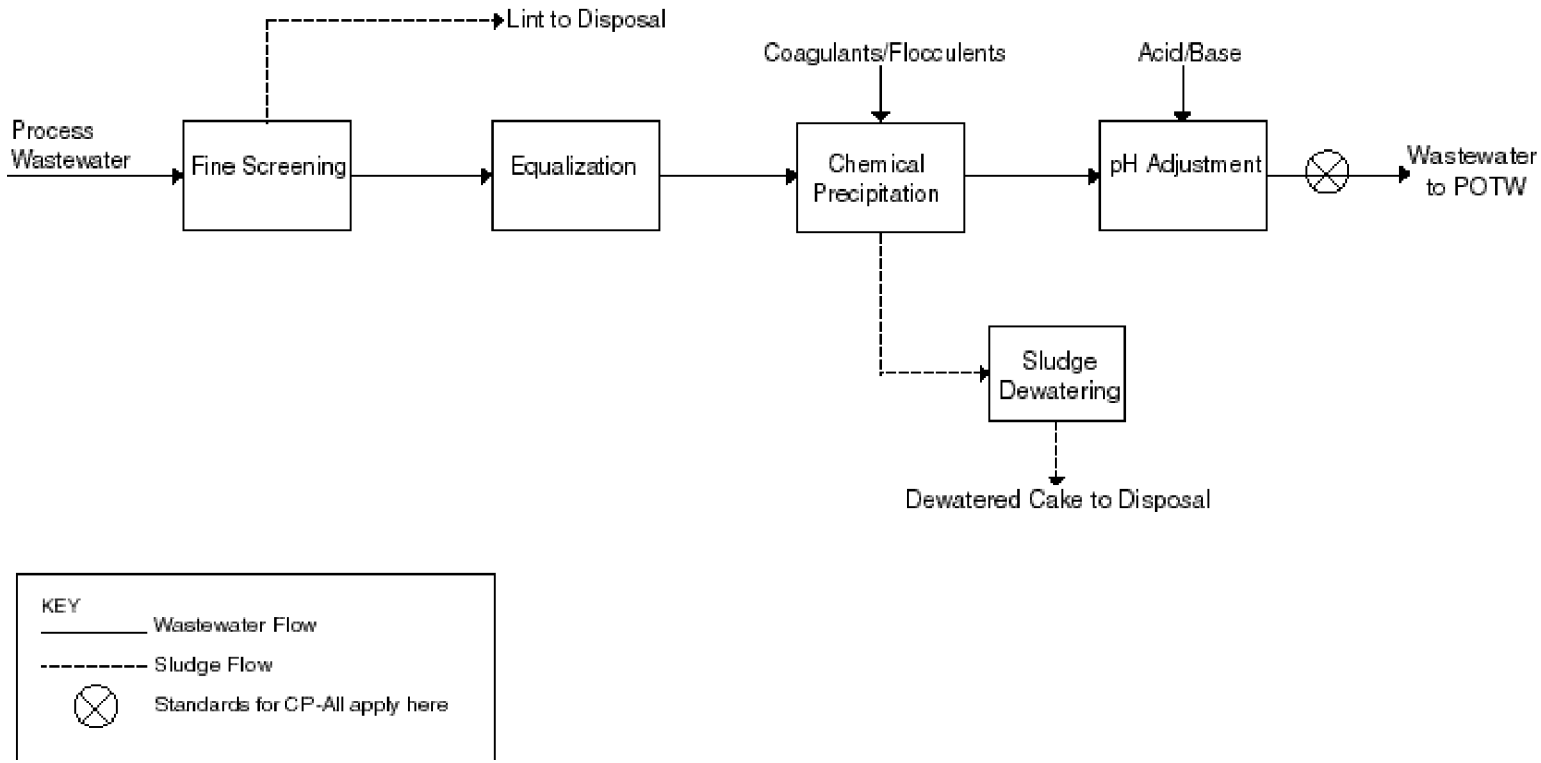

Figure 10-5. CP-All Option: Chemical Precipitation of Total Facility Process Wastewater

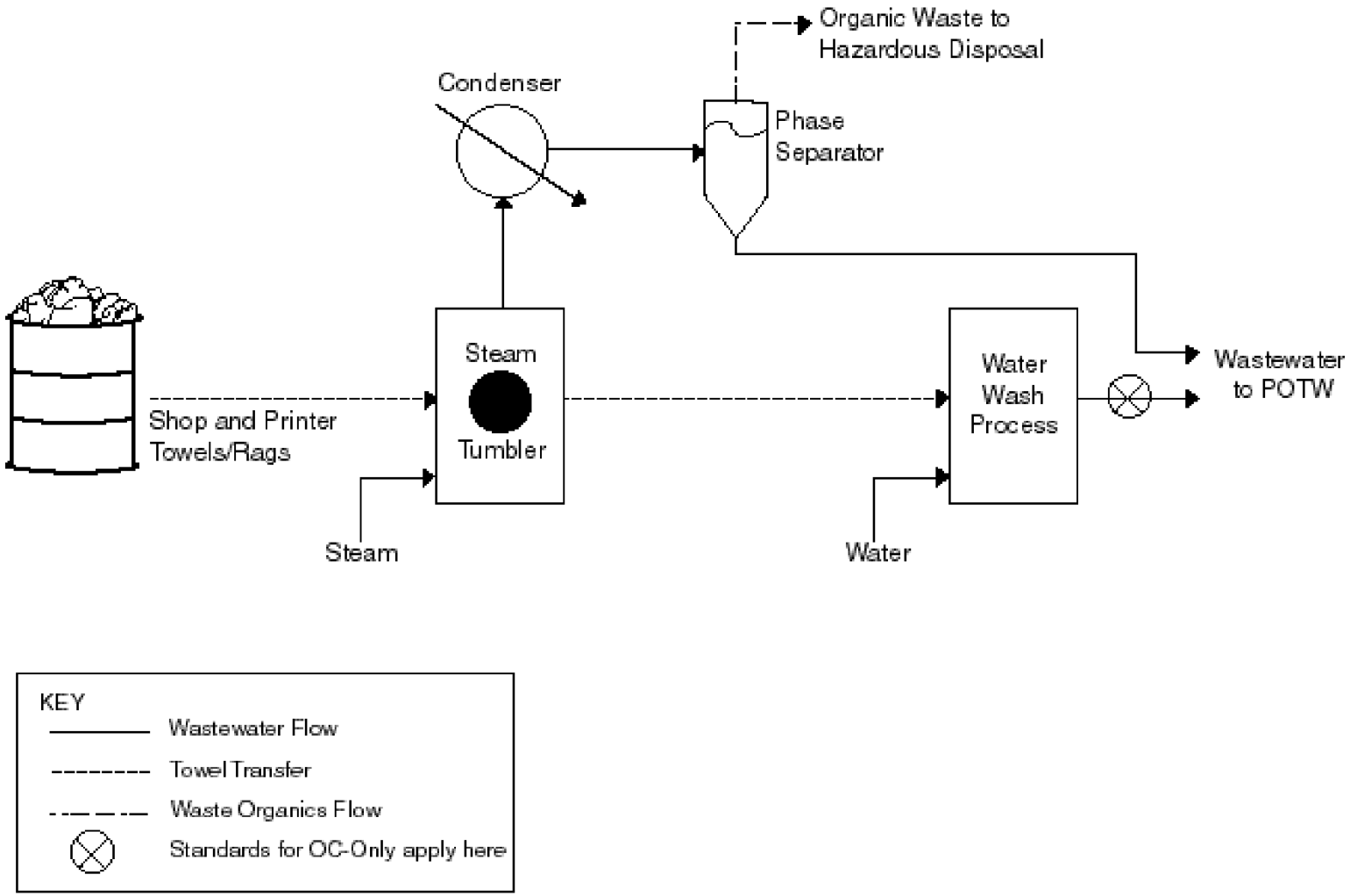

Figure 10-6. OC-Only Option: In-Process Organics Control

10.2.2 Inclusion of Pollution Prevention in the Technology Options

Most of the preprocess pollution prevention activities reported in the detailed questionnaire involve good operating practices that any industrial laundry can implement. The two most commonly reported activities, refusal of items containing free liquids and refusal of certain items, require that laundries work with their customers to reduce pollutant loads. This presents a challenge to facilities to maintain their customer base while still controlling the amount of contaminants they take in. Another commonly reported preprocess activity viewed as a good operating practice is the reduction of free liquids in laundry items by centrifugation before the items are water washed. After centrifugation, the liquid removed from the items is reused by the customer or disposed of as hazardous waste. Either the customer or the industrial laundry can perform this activity.

All of the in-process pollution prevention activities reported by the facilities reduce pollution and reduce operating costs by optimizing facility operations. The installation of alternative washers and automated liquid injection systems for washers, the use of alternative washing chemicals, the use of water softening, and the implementation of water reuse/reduction all can reduce the amount of water and/or chemicals that a facility uses. A significant number of facilities have improved employee training and housekeeping standards; these activities can also decrease water and chemical use. In addition, changes in laundering chemicals were reported to improve treatability of the wastewater by forming less refractory emulsions.

Most of the facilities from which EPA has gathered data used for the development of DAF and chemical precipitation pretreatment standards practice refusal of items containing free liquids. Therefore, EPA has included this preprocess pollution prevention practice as a component of the technology options involving DAF or chemical precipitation treatment of process wastewater. No other pollution prevention activities were consistently practiced by facilities from which data were obtained to develop pretreatment standards.

10.2.3 Exclusion of Wastewater Recycling Activities from the Technology Options

Some industrial laundries reported that they have incorporated wastewater recycling activities into their processes, as described previously in Section 8.4.1. EPA has found that the implementation of wastewater recycling is a facility-specific issue that is largely dependent upon customer demands on product quality, the facility's product mix, and the level of wastewater treatment at the facility. In addition, EPA has limited data that show wastewater recycling activities in the industrial laundries industry do not necessarily result in a facility using less process water being used overall (2). EPA concluded that it does not have sufficient data to completely analyze the effects of wastewater recycling on costs or pollutant loadings. Therefore, EPA did not incorporate wastewater recycling activities into the technology options.

10.2.4 Initial Technology Options Not Further Considered

EPA eliminated the Heavy options from further consideration because it was determined that in these options, the untreated light wastewater stream at some facilities has higher concentrations of pollutants than the treated heavy wastewater stream. In addition, for these technology options, standards would be applicable to only a portion of a facility's wastewater flow. This presents a significant difficulty for the permitting authorities and regulated facilities in that these options would require an in-plant monitoring point. This also would be coupled with a need for detailed record keeping by the facility and information collection by the permitter regarding production and flow rates associated with specific laundry items to assure compliance with standards developed for the Heavy options. EPA ultimately concluded that in-plant standards and this level of detailed data collection present an unacceptable compliance burden and cost to the industrial laundries industry that is not warranted.

10.2.5 Additional Technology Options Considered

EPA considered additional alternative technology options, which were variations on the initial DAF and chemical precipitation technology options presented above, to find the most cost-effective option for the industry. These additional options involve treating different portions of the total facility process wastewater, then combining the treated and untreated wastewater prior to monitoring and final discharge. The standards for these additional technology options are based on performance data obtained from either DAF or chemical precipitation treatment of the total facility process wastewater stream. In other words, the standards for the additional technology options are the same as those for the DAF-All and CP-All initial technology options described previously. These additional regulatory options are described in the sections below.

Table 10-2 summarizes the 10 additional technology options and the number of facilities that have equivalent or better treatment currently in place.

Industrial Laundry Wastewater (IL) Technology Options

The IL wastewater technology options, DAF-IL and CP-IL, are similar to the DAF-Heavy and CP-Heavy technology options shown in Figures 10-2 and 10-3, respectively, in that they treat a portion of the facility's wastewater stream. However, in the IL options, wastewater from both heavy and light industrial items is treated. The treated stream is combined with the untreated linen wastewater stream prior to monitoring and discharge. Thus, in Figures 10-2 and 10-3 the heavy and light industrial wastewater streams are represented by the "heavy" stream in the diagram and the linen wastewater stream is represented by the "light" stream in the diagram. The standards applied to the combined streams would be based on treatment performance data for the DAF-All technology option (in the DAF-IL option) and the CP-All technology option (in the CP-IL option).

Table 10-2

Definitions of Additional Technology Options Considered for PSES

Regulatory Option	Description	Basis of Standards	Number of Facilities with Equivalent or Better Treatment In Place[1]
DAF-IL	Dissolved air flotation of wastewater from industrial laundry items.	DAF-All	1
CP-IL	Chemical precipitation of wastewater from industrial laundry items.	CP-All	1
Combo-IL	Dissolved air flotation or chemical precipitation of wastewater from industrial laundry items. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All	2
Combo-IL-2LIM	Dissolved air flotation or chemical precipitation of wastewater from industrial laundry items. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed	2
DAF-TWL	Dissolved air flotation of wastewater from heavy industrial laundry items.	DAF-All	1
CP-TWL	Chemical precipitation of wastewater from heavy industrial laundry items.	CP-All	7[2]
Combo-TWL	Dissolved air flotation or chemical precipitation of wastewater from heavy industrial laundry items. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All	8[2]
Combo-TWL-2LIM	Dissolved air flotation or chemical precipitation of wastewater from heavy industrial laundry items. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed	8[2]
Combo-All	Dissolved air flotation or chemical precipitation of all facility process wastewater. Facilities without treatment are costed for the less expensive technology on an annualized basis.	The higher LTA between DAF-All and CP-All	50[3]
Combo-All-2LIM	Dissolved air flotation or chemical precipitation of all facility process wastewater. Facilities without treatment are costed for chemical precipitation.	DAF-All or CP-All, based on technology costed	50[3]

[1]Data obtained from 193 in-scope facilities that responded to the detailed questionnaire. In-scope facilities were those that meet the definition of an industrial laundry as presented in Chapter 6, regardless of annual production.
[2]One of these facilities operates a microfiltration unit to treat a portion of its process wastewater. Since microfiltration can achieve lower final effluent pollutant concentrations than chemical precipitation (1), this facility is considered to have better treatment in place for the CP-Heavy option.
[3]One of these facilities operates an ultrafiltration unit to treat all of its process wastewater. Since ultrafiltration can achieve lower final effluent concentrations than chemical precipitation (1), this facility is considered to have better treatment in place for the CP-All option.
LTA - Long-term average

EPA has determined that the wastewater generated from laundering of linen items has pollutant concentrations generally lower than the standards developed from both DAF and chemical precipitation treatment of the total facility process wastewater stream. Therefore, pollutant concentrations in the combined streams prior to final discharge for the IL options would be lower than the standards based on treatment of the total process wastewater stream (DAF-All and CP-All). EPA concluded that linen wastewater does not need treatment to meet those standards. EPA developed the IL wastewater technology options to import lower-cost treatment systems to treat a portion of the facility's process wastewater.

Towel (TWL) Technology Options

The TWL wastewater technology options are nearly identical to the DAF-Heavy and CP-Heavy technology options shown in Figures 10-2 and 10-3, respectively, including treatment of wastewater generated from washing heavy industrial laundry items, as defined in Section 10.2.1. Light industrial and linen wastewater is discharged without treatment. Thus, in Figures 10-2 and 10-3 the heavy industrial wastewater stream is represented by the "heavy" stream in the diagram and the light industrial and linen wastewater streams are represented by the "light" stream in the diagram. However, the TWL options incorporate standards that are applied to the combined untreated and treated streams prior to discharge and that are based on treatment performance data for the DAF-All and CP-All technology options.

Combination (Combo) Technology Options

EPA also considered technology options in which standards would be based on a combination of the DAF-IL and CP-IL standards in order to allow for increased flexibility in the technologies used by the industry to treat their industrial laundry wastewater, allowing for a more cost-effective technology option. These combination (Combo) options, Combo-IL and Combo-IL-2LIM, are described below.

The Combo-IL technology option combines both the DAF-IL and CP-IL standards into one set of standards for the industrial laundry industry. These standards would be established based on the less stringent of the standards for the two technology options for each pollutant. EPA's data show that, overall, chemical precipitation performs somewhat better than DAF in treating industrial laundry process wastewater. However, many industrial laundries have already installed DAF systems. Having one set of standards allows flexibility for facilities with either technology currently in place to meet those standards. In developing cost estimates for this option, industrial laundries that already have DAF or chemical precipitation treatment systems with enough capacity to treat the heavy wastewater stream (as defined above under the IL Technology Options section) were assumed to continue to treat their wastewater using their existing technology. Industrial laundries with little or no treatment (including facilities that treat their wastewater with chemical emulsion breaking) were costed for the least expensive technology option (based on a comparison of DAF-IL and CP-IL annualized costs) to treat their industrial laundry wastewater.

The Combo-IL-2LIM technology option is similar to the Combo-IL option described above. In this option, the standards for the DAF-IL option would apply to facilities using DAF to treat their wastewater and the standards for the CP-IL option would apply to all other facilities. This option also allows flexibility for facilities with DAF treatment in place (DAF is the most common treatment in the industry) to comply with DAF-based standards, but requires all other facilities to comply with slightly more stringent standards based on chemical precipitation. In developing cost estimates for this option, industrial laundries that already have DAF or chemical precipitation treatment systems with enough capacity to treat the heavy wastewater steam (as defined above under the IL Technology Options section) were assumed to continue to treat their wastewater using their existing technology. Industrial laundries with little or no treatment (including facilities that treat their wastewater with chemical emulsion breaking) were costed for the CP-IL technology option to treat their industrial laundry wastewater.

EPA also considered Combo options in which all process wastewater would be treated (Combo-All and Combo-All-2LIM). These options were modeled in a similar manner to the Combo-IL and Combo-IL-2LIM options described above, but resulted in higher compliance posts.

As in the IL options, EPA also considered additional TWL technology options (Combo-TWL and Combo-TWL-2LIM) in which standards are based on a combination of the DAF-TWL and CP-TWL standards in order to allow for increased flexibility in the technologies used by industry to treat their heavy industrial laundry wastewater, allowing for a more cost-effective technology option.

10.2.6 Technology Options Eliminated from Further Consideration

Based on technical and economic analyses, EPA eliminated the following technology options from further consideration:

- DAF-TWL;
- CP-TWL;
- Combo-TWL;
- Combo-TWL-2LIM;
- DAF-All;
- CP-All;
- Combo-All; and
- Combo-All-2LIM.

The reasons for eliminating these options from further consideration are presented below.

EPA eliminated the TWL options from further consideration because the pollutant concentrations in the untreated light industrial and linen wastewater streams are higher than the standards for these technology options. The standards for the TWL options would be based on

the treatment of total facility process wastewater and EPA determined that these standards could not be met with the treatment schemes of the TWL options.

EPA eliminated the All options from further consideration because although the IL and the All options can achieve the same effluent pollutant concentrations, the costs to treat the total facility process wastewater in the All options are higher than the costs for the IL options.

No Regulation Option

EPA also considered a no regulation option, which entails having no national standards. Facilities would only need to comply with applicable local standards. EPA rejected the No Regulation option because it provides no control of pollutants passing through or interfering with POTW operations. Further, the No Regulation option would not represent best available technology economically achievable or best available demonstrated control technology as those terms are applied for the purpose of setting pretreatment standards.

10.2.7 Regulatory Options Further Considered for PSES

The remaining five technology options further considered for the industrial laundries rule are:

- DAF-IL;
- CP-IL;
- Combo-IL;
- Combo-IL-2LIM; and
- OC-Only.

These options became regulatory options considered as the basis for the proposed PSES. EPA performed detailed analyses of costs, pollutant removals, and economic impacts for these options as described in Chapter 12 of this document and the Economic Assessment (EA) (3).

10.3 Pretreatment Standards for New Sources (PSNS)

Pretreatment standards for new sources establish quantitative standards on the indirect discharge of priority and nonconventional pollutants to waters of the United States. Industry has the opportunity to design and install the best and most efficient processes and wastewater treatment systems at new facilities. Accordingly, Congress directed EPA to consider the best demonstrated alternative processes, process changes, in-plant control measures, and end-of-pipe wastewater treatment technologies that reduce pollution to the maximum extent feasible. In response to that directive, EPA considered effluent reductions attainable by the most advanced and demonstrated process and treatment technologies at industrial laundries. EPA considered the five regulatory options evaluated as the basis for the proposed PSES as the basis for the proposed PSNS.

10.4 References

1. Bartman, Gary H., Crossflow Microfiltration, A Cost Effective Approach to Treat Metals, Oil and Grease in the Industrial Laundries and Metal Finishing Industries, EPOC Filtration and Separation Systems, Fresno, CA, February, 1993.

2. Memorandum: Preliminary Data for Calculating Mass-Based Limitations for the Industrial Laundries Industry, August 15, 1997 (DCN L04319).

3. U.S. Environmental Protection Agency. Economic Assessment for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category. EPA-821-R-97-005, Washington, DC, November 1997.

CHAPTER 11

POLLUTANT LOADING AND REMOVAL ESTIMATES

11.1 Introduction

This chapter presents annual pollutant loading and removal estimates for the industrial laundries industry for each of the regulatory options. EPA estimated the pollutant loadings and removals from industrial laundries to evaluate the effectiveness of the treatment technologies, to estimate benefits gained from the removal of pollutants discharged through publicly owned treatment works (POTWs) to surface water, and to evaluate the cost effectiveness of the regulatory options in reducing the pollutant loadings. Untreated, baseline, and postcompliance pollutant loadings and pollutant removals for the industry were estimated for 72 pollutants of concern using data collected from the industry throughout development of the proposed rule. Untreated, baseline, and postcompliance pollutant loadings are defined as follows:

- Untreated loadings -- pollutant loadings in industrial laundry raw wastewater. These loadings do not account for wastewater treatment currently in place at industrial laundries.

- Baseline loadings -- pollutant loadings in industrial laundry wastewater currently being discharged to POTWs. These loadings do account for wastewater treatment currently in place at industrial laundries.

- Postcompliance loadings -- pollutant loadings in industrial laundry wastewater after implementation of the rule. These loadings are calculated assuming that all industrial laundries would operate wastewater treatment technologies equivalent to the technology option.

The following information is presented in this chapter:

- Section 11.2 presents the data sources that were used to estimate pollutant loadings and removals;

- Section 11.3 discusses the methodology used to estimate pollutant loadings and pollutant removals; and

- Section 11.4 presents the pollutant loadings and removals for each regulatory option, including untreated, baseline, and postcompliance pollutant loadings and removals of pollutants from baseline levels to postcompliance levels.

11.2 Data Sources

EPA used data from several sources to estimate untreated, baseline, and postcompliance loadings for industrial laundry wastewater. These sources included EPA site visits and sampling episodes at industrial laundries, detailed monitoring questionnaires (DMQ), and the Preliminary Data Summary (PDS). These data sources are discussed in detail in Chapter 3.

To estimate untreated pollutant loadings for the industrial laundries industry, EPA estimated pollutant concentrations and loadings for 72 pollutants at 193 in-scope industrial laundries that submitted sufficient information in response to the 1993 detailed questionnaire (in-scope facilities meet the definition of an industrial laundry as presented in Chapter 6, regardless of their annual production). EPA then extrapolated the loadings to the entire industry based on the survey weights developed for each facility. The pollutant concentrations and loadings for each facility were estimated using analytical data obtained by EPA for specific laundering processes and item types, and the process/item-specific production reported in the detailed questionnaire.

EPA collected data for specific process/item combinations for individual loads laundered at a facility or for an entire stream generated from the same process/item combination. EPA used the following process/item data to estimate untreated pollutant loadings:

- Water washing of industrial garments -- data from two loads of pants and two loads of shirts collected during two sampling episodes;
- Water washing of shop towels -- data from three loads of shop towels collected during three sampling episodes and two days of PDS data from a shop-towel-only stream at a facility sampled for the PDS.;
- Water washing of printer towels/rags -- data from three loads of printer towels/rags collected during three sampling episodes;
- Water washing of mats -- data from one load of mats collected during a sampling episode;
- Water washing of mops -- data from two loads of mops (with either no oil treatment or oil added outside of the washer) collected during two sampling episodes;
- Steam tumbling followed by water washing of printer towels/rags -- data from one load collected during a sampling episode;

- Water washing of linen items -- three days of data for a linen-only stream collected during a sampling episode and DMQ data for three facilities that launder greater than 93 percent linen; and

- Dry cleaning followed by water washing of shop towels, printer towels/rags, and gloves -- facility-collected data obtained during a site visit from a wastewater stream generated from dry cleaning followed by water washing.

Data submitted by one facility for clean room items and denim prewashing data obtained by EPA during a site visit were not used to estimate pollutant loadings and removals because the data were not available at the time the analysis was completed.

Data used for estimating postcompliance loadings for each regulatory option are presented in Chapters 9 and 10 and are summarized as follows:

- Organics Control (Steam Tumbling) of Heavy Industrial Laundry Items (OC-Only) -- data from one load of steam-tumbled printer towels/rags;

- Dissolved Air Flotation of Industrial Laundry Wastewater (DAF-IL) -- data from two sampled facilities and four DMQ facilities;

- Chemical Precipitation of Industrial Laundry Wastewater (CP-IL) -- data from one sampled facility and five DMQ facilities; and

- Dissolved Air Flotation or Chemical Precipitation of Industrial Laundry Wastewater (Combo-IL and Combo-IL-2LIM) -- for dissolved air flotation, data from two sampled facilities and four DMQ facilities; for chemical precipitation, data from one sampled facility and five DMQ facilities.

Baseline loadings for individual facilities were estimated from untreated or postcompliance loadings, based on the wastewater treatment in place reported by the facility in the detailed questionnaire. Section 11.3 below present details on the methodology used to estimate the pollutant loadings and removals.

11.3 Methodology Used to Estimate Pollutant Loadings and Removals

This section presents the methodology used to estimate untreated, baseline, and postcompliance pollutant loadings and removals of pollutants from baseline levels to postcompliance levels.

11.3.1 Methodology Used to Estimate Untreated Pollutant Loadings

EPA estimated untreated pollutant loadings for each of the 193 in-scope facilities using the process/item-specific data discussed in Section 11.2 of this document, and extrapolated these loadings to represent the entire industry using the appropriate survey weights. Untreated pollutant loadings do not account for pollutant removals by wastewater treatment technologies currently in place at industrial laundries.

The amount of pollutant generated per pound of laundry was estimated from the process/item-specific data. EPA estimated the pollutant loadings per pound of item laundered for each process/item combination using the following equation:

$$\text{Concentration (mg/L, for process/item data)} \times \frac{\text{Flow (L, for process/item)}}{\text{Production (lbs, for process/item)}} = \text{Amount of pollutant generated per pound of laundry (mg/lb)}$$

The pollutant loading per pound of item was calculated for each item-specific stream for which data were available. If data from more than one load or more than one facility represented a process/item combination, an average of the individual load or facility's pollutant loadings was calculated. If a specific pollutant was never detected or never analyzed for on a particular item, the pollutant loading for that process/item/pollutant combination was set to zero milligrams of pollutant per pound of laundry. Table 11-1 presents the pollutant loading generated per pound of item for several pollutants and groups of pollutants (e.g., toxic organic pollutants) for the process/item combinations presented in Section 11.2 of this document.

Data were not obtained for all the process/item combinations reported by the 193 in-scope facilities in the detailed questionnaires. To estimate the pollutant loadings for all facilities, EPA transferred data from the process/item combinations with data available to other process/item-specific combinations for which data were not available. Table 11-2 presents these data transfers.

For each facility, EPA then calculated the untreated wastewater pollutant concentrations and loadings from the amount of pollutant generated per pound of laundry for each process/item combination and process/item-specific production and flow data. The following equation was used to calculate the pollutant concentrations for each facility:

$$\text{Amount of pollutant generated per pound of laundry (mg/lb)} \times \frac{\text{Production (lbs of process/item at facility)}}{\text{Flow (L, for process/item at facility)}} = \text{Concentration (mg/L for process/item at facility)}$$

Table 11-1
Pollutant Loadings per Pound of Item Processed
(mg Pollutant/lb Laundry)

Pollutant	Industrial Garments	Shop Towels	Printer Towels	Steam Tumbled Printer Towels	Mats	Mops	Linen Items	Items Dry Cleaned Prior to Water Washing
BOD_5	3,099	18,560	51,581	12,998	767	13,646	7,237	1,605
HEM	681	22,256	94,464	15,535	261	3,378	1,295	NA
SGT-HEM	357	13,637	30,828	4,226	102	1,316	147	NA
TSS	2,625	42,494	14,735	11,915	1,128	13,152	2,241	1,165
COD	13,846	127,674	222,981	81,240	247	64,242	9,376	9,011
TOC	2,907	17,315	33,168	15,977	575	6,192	4,817	NA
TXM	24	266	326	75	5	73	15	26
TXO	6	316	1,045	89	19	53	25	18
NCM	119	646	298	93	33	348	83	33
NCO	14	1,507	2,707	1,041	21	247	54	22

BOD_5 - Biochemical oxygen demand
HEM - Oil and grease (measured as hexane extractable material)
SGT-HEM - Total petroleum hydrocarbons (measured as silica gel treated-hexane extractable material)
TSS - Total suspended solids
COD - Chemical oxygen demand
TOC - Total organic carbon
TXM - Total priority metals and elements
TXO - Total priority organics
NCM - Nonconventional metals
NCO - Nonconventional organics
NA - Data not available

Table 11-2

Analytical Data Transfers

Analytical Data Transfers for Water-Washed Items[1]		
Item	**Item-Specific Data to be Transferred**	**Basis of Data Transfer**
Health-Care Items (B08)	Linen (B06, B07)	Customer and Use
Family Laundry (B15)	Linen (B06, B07)	Customer and Use
Executive Wear (B18)	Linen (B06, B07)	Customer and Use
Continuous Roll Towels (B10)	Linen (B06, B07)	Customer
Miscellaneous Not Our Goods (NOG) (B19)	Linen (B06, B07)	Customer
New Items (B17)	Linen (B06, B07)	Pollutant Loading
Clean Room Garments (B11)	Industrial Garments (B01)	Customer
Laundry Bags (B14)	Industrial Garments (B01)	Customer and Chemical Use
Fender Covers (B09)	Shop Towels (B02)	Use and Customer
Filters (B23)	Shop Towels (B02)	Use and Customer
Other (unspecified) (B13)	Floor Mats (B04)	Chemical Use
Buffing Pads (B24)	Floor Mats (B04)	Customer and Use
Analytical Data Transfers for Processes		
Process	**Process Data to be Transferred**	**Basis of Data Transfer**
Denim Prewash	Water Washing of Linen Items	Pollutant Loading
Dual-Phase Processing	Dry Cleaning Followed by Water Washing[2]	Chemical Use and Pollutant Loading

[1]Codes in parenthesis refer to codes used in the detailed questionnaire.
[2]If data were not available for a specific pollutant, data were transferred from water washing of mats.

From the facility-specific concentration, the pollutant loading was calculated using the following equation:

$$\text{Facility untreated concentration (mg/L, for process/item)} \times \text{Facility annual flow (L/yr, for process/item)} \times \frac{1\text{ lb}}{453{,}600\text{ mg}} = \text{Facility untreated annual loading (lb/yr)}$$

To estimate the total untreated wastewater pollutant loading for a facility, the loadings calculated from each process/item combination were summed together for each pollutant.

11.3.2 Methodology Used to Estimate Baseline and Postcompliance Wastewater Loadings

Industry baseline loadings represent the industry pollutant loadings after accounting for removal of pollutants from untreated wastewater by treatment technologies in place at industrial laundries. Chapter 12 discusses the assessment of treatment in place for industrial laundries. The treatment technologies in use at industrial laundries, based on the detailed questionnaire, included chemical emulsion breaking, dissolved air flotation, chemical precipitation, and ultrafiltration. Some facilities use these technologies to treat their entire process wastewater stream, while other facilities treat only part of their process wastewater. Table 11-3 shows the methodology used to estimate baseline loadings for each facility. EPA estimated the baseline loadings for facilities with ultrafiltration or microfiltration treatment systems using the data for chemical precipitation treatment systems.

Postcompliance pollutant loadings for each regulatory option represent the total industry wastewater pollutant loadings after implementation of the proposed rule. Postcompliance pollutant loadings were estimated from the target average concentrations and the annual facility wastewater discharge flow for each of the 193 in-scope facilities as shown in the following equation:

$$\text{Postcompliance target average concentration (mg/L)} \times \text{Facility annual discharge flow (L/yr)} \times \frac{1\text{ lb}}{453{,}600\text{ mg}} = \text{Facility postcompliance annual loading (lbs/yr)}$$

Target average concentrations were calculated from the analytical data described in Section 11.2 of this document. The target average concentrations for OC-Only are presented in Chapter 9. Prior to calculating target average concentrations for DAF-IL and CP-IL, the data were edited using procedures described in Chapter 9 for calculating long-term averages, with the exception that the average concentration of a pollutant in the influent samples collected from a facility did not need to be greater than ten times the method detection level for that pollutant. Table 11-4 presents the target average concentrations for DAF-IL and CP-IL. The target effluent concentrations for Combo-IL and Combo-IL-2LIM are derived from DAF-IL and CP-IL, depending on the technology chosen.

Table 11-3

Methodology Used to Estimate Baseline Loadings for the Industrial Laundries Industry

Facility Treatment in Place	Source for Baseline Loadings
No Treatment	Estimated from untreated wastewater concentrations
CEB - partial stream[1,2]	Treated stream loading estimated from target average concentrations for CEB-Heavy and untreated stream loading estimated from untreated wastewater concentrations
DAF - partial stream[1]	Treated stream loading estimated from target average concentrations for DAF-IL and untreated stream loading estimated from untreated wastewater concentrations
CP - partial stream[1]	Treated stream loading estimated from target average concentrations for CP-IL and untreated stream loading estimated from untreated wastewater concentrations
DAF - total stream	Treated stream loading estimated from target average concentrations for DAF-All
CP - total stream	Treated stream loading estimated from target average concentrations for CP-All

[1]For the purposes of estimating baseline loads, EPA assumed that the stream reported as treated by the facility is equivalent to the industrial laundry stream estimated for the IL-Options described in Chapter 10.
[2]Three facilities reported CEB treatment of the total wastewater stream. EPA does not have data representing CEB treatment of the total wastewater stream; the loadings for these facilities were estimated assuming they are only treating heavy wastewater.

CEB - Chemical emulsion breaking
DAF - Dissolved air flotation
CP - Chemical precipitation
CEB-Heavy - Chemical emulsion breaking of heavy industrial laundry wastewater
DAF-IL - Dissolved air flotation of industrial laundry wastewater
CP-IL - Chemical precipitation of industrial laundry wastewater
DAF-All - Dissolved air flotation of all process wastewater
CP-All - Chemical precipitation of all process wastewater

Table 11-4
Target Average Concentrations for DAF-IL and CP-IL for the Pollutants of Concern[1]

Pollutant of Concern	Target Average Concentration (mg/L)	
	DAF-IL	CP-IL
Conventionals		
Biochemical Oxygen Demand 5-Day (BOD_5)	497	499
Oil and Grease (measured as HEM)	37.8	28.5
Total Suspended Solids (TSS)	85.5	119
Priority Organics		
1,1,1-Trichloroethane	0.0100	0.471
1,2-Diphenylhydrazine	---	---
4-Chloro-3-methylphenol	0.151	0.042
Bis(2-ethylhexyl) Phthalate	0.144	0.109
Butyl Benzyl Phthalate	0.216	0.0342
Chlorobenzene	0.0280	0.0336
Chloroform	0.185	0.0513
Di-*n*-butyl Phthalate	0.125	0.0342
Di-*n*-octyl Phthalate	0.0280	0.0342
Ethylbenzene	0.0605	0.269
Isophorone	---	0.297
Methylene Chloride	0.546	0.126
Naphthalene	0.0764	0.0583
Phenol	0.211	---
Tetrachloroethene	0.250	0.259
Toluene	0.711	1.05
trans-1,2-Dichloroethene	---	---
Trichloroethene	---	---
Nonconventional Organics		
2-Butanone	17.4	3.23
2-Methylnaphthalene	0.116	0.0125
2-Propanone	13.6	---

Table 11-4 (Continued)

Pollutant of Concern	Target Average Concentration (mg/L)	
	DAF-IL	CP-IL
4-Methyl-2-pentanone	0.595	3.13
∝-Terpineol	0.472	---
Nonconventional Organics (Continued)		
Benzoic Acid	1.58	---
Benzyl Alcohol	---	---
Hexanoic Acid	---	---
m-Xylene	0.327	0.347
n-Decane	0.469	0.104
n-Docosane	0.0232	0.0110
n-Dodecane	0.195	2.83
n-Eicosane	0.0477	0.0167
n-Hexacosane	0.0195	0.0144
n-Hexadecane	0.0842	0.0682
n-Octacosane	0.0100	0.0168
n-Octadecane	0.0694	0.0309
n-Tetracosane	0.0219	0.0107
n-Tetradecane	0.0754	0.0601
n-Triacontane	0.0100	0.0138
o-&*p*-Xylene	0.271	0.231
p-Cresol	0.117	---
p-Cymene	0.0700	---
Pentamethylbenzene	---	---
Priority Metals and Elements		
Antimony	0.0593	0.0182
Arsenic	0.0259	0.0197
Beryllium	---	0.00100
Cadmium	0.0145	0.00691
Chromium	0.0695	0.0426
Copper	0.478	0.139
Lead	0.175	0.100

Table 11-4 (Continued)

Pollutant of Concern	Target Average Concentration (mg/L)	
	DAF-IL	CP-IL
Mercury	0.000242	---
Nickel	0.0406	0.0356
Selenium	0.0524	---
Silver	0.0188	0.0194
Priority Metals and Elements (Continued)		
Thallium	0.00294	---
Zinc	0.837	0.200
Nonconventional Metals and Elements		
Aluminum	1.31	0.468
Barium	0.0584	0.261
Boron	0.522	0.238
Cobalt	0.0381	0.0316
Iron	2.79	4.12
Manganese	0.0340	0.00877
Molybdenum	0.119	0.457
Tin	0.0631	0.0103
Titanium	0.0112	0.0179
Vanadium	0.00700	0.0100
Yttrium	0.00208	0.00500
Bulk Nonconventionals		
Chemical Oxygen Demand (COD)	998	1080
Total Organic Carbon (TOC)	326	342
Total Petroleum Hydrocarbon (measured as	13.7	10.8

[1]Target average concentrations for OC-Only are presented in Chapter 9. Target average concentrations for Combo-IL and Combo-IL-2LIM are dervived from the target average concentrations for DAF-IL and CP-IL.
HEM - Hexane extractable material.
SGT-HEM - Silica gel treated-hexane extractable material.

To estimate postcompliance loading for facilities with treatment in place, EPA ranked the treatment technologies in use by their performance. Based on data and information collected during the development of this proposed rule, EPA determined that ultrafiltration, microfiltration, and chemical precipitation generally achieve lower pollutant concentrations in treated wastewater than dissolved air flotation, and that dissolved air flotation achieves lower pollutant concentrations in treated wastewater than chemical emulsion breaking. Tables 11-5 through 11-8 present the methodologies used to estimate the postcompliance loadings for the DAF-IL, CP-IL, COMBO-IL, and COMBO-IL-2LIM regulatory options, based on the facility's treatment in place.

Postcompliance loadings for OC-Only were estimated using the target average concentrations for 24 pollutants of concern considered to be controlled by this technology and the target average concentrations for the applicable treatment system (or untreated concentrations for facilities with no treatment) for the remaining 49 pollutants of concern not controlled by this technology. No facilities have treatment in place equivalent to this regulatory option.

11.3.3 Methodology Used to Estimate Pollutant Removals

Pollutant removals represent the difference between baseline loadings and postcompliance loadings for each regulatory option. Because all the identified industrial laundries are indirect dischargers, the removals presented here represent removals of pollutants being discharged to POTWs. EPA calculated the pollutant removals for each facility using the following equation:

$$\text{Baseline Loadings} - \text{Postcompliance Loadings} = \text{Pollutant Removals}$$

EPA used the following methodology to estimate pollutant removals:

1) If the postcompliance loading of a pollutant was higher than the baseline loading, the removal was set to zero;

2) If the pollutant was not present at baseline, the removal was set to zero; and

3) If a long-term average was not calculated for a pollutant for a technology option (i.e., the postcompliance loading for the pollutant could not be calculated), the removal was set to zero.

Table 11-5

Methodology Used to Estimate Postcompliance Loadings for DAF-IL for the Industrial Laundries Industry

Facility Treatment in Place	Source for Postcompliance Loadings
No Treatment	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL; linen stream loading estimated from untreated wastewater concentrations
CEB - partial stream	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - partial stream	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL; linen stream loading estimated from untreated wastewater concentrations
CP - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - total stream	Total stream loading estimated from the target average concentrations for DAF-All
CP - total stream	Total stream loading estimated from the target average concentrations for CP-All

CEB - Chemical Emulsion Breaking
DAF - Dissolved Air Flotation
CP - Chemical Precipitation
DAF-IL - Dissolved Air Flotation of Industrial Laundry Wastewater
CP-IL - Chemical Precipitation of Industrial Laundry Wastewater
DAF-All - Dissolved Air Flotation of All Process Wastewater
CP-All - Chemical Precipitation of All Process Wastewater

Table 11-6

Methodology Used to Estimate Postcompliance Loadings for CP-IL for the Industrial Laundries Industry

Facility Treatment in Place	Source for Postcompliance Loadings
No Treatment	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
CEB - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
CP - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - total stream	Total stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
CP - total stream	Total stream loading estimated from the target average concentrations for CP-All

CEB - Chemical Emulsion Breaking
DAF - Dissolved Air Flotation
CP - Chemical Precipitation
CP-IL - Chemical Precipitation of Industrial Laundry Wastewater
CP-All - Chemical Precipitation of All Process Wastewater

Table 11-7

Methodology Used to Estimate Postcompliance Loadings for Combo-IL for the Industrial Laundries Industry

Facility Treatment in Place	Source for Postcompliance Loadings
No Treatment	Industrial laundry stream loading estimated from the higher target average concentrations between DAF-IL and CP-IL; linen stream loading estimated from untreated wastewater concentrations
CEB - partial stream	Industrial laundry stream loading estimated from the higher target average concentrations between DAF-IL and CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - partial stream	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL; linen stream loading estimated from untreated wastewater concentrations
CP - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - total stream	Total stream loading estimated from the target average concentrations for DAF-ALL
CP - total stream	Total stream loading estimated from the target average concentrations for CP-ALL

CEB - Chemical Emulsion Breaking
DAF - Dissolved Air Flotation
CP - Chemical Precipitation
DAF-IL - Dissolved Air Flotation of Industrial Laundry Wastewater
CP-IL - Chemical Precipitation of Industrial Laundry Wastewater
DAF-All - Dissolved Air Flotation of All Process Wastewater
CP-All - Chemical Precipitation of All Process Wastewater

Table 11-8

Methodology Used to Estimate Postcompliance Loadings for Combo-IL-2LIM for the Industrial Laundries Industry

Facility Treatment in Place	Source for Postcompliance Loadings
No Treatment	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
CEB - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - partial stream	Industrial laundry stream loading estimated from the target average concentrations for DAF-IL; linen stream loading estimated from untreated wastewater concentrations
CP - partial stream	Industrial laundry stream loading estimated from the target average concentrations for CP-IL; linen stream loading estimated from untreated wastewater concentrations
DAF - total stream	Total stream loading estimated from the target average concentrations for DAF-All
CP - total stream	Total stream loading estimated from the target average concentrations for CP-All

CEB - Chemical Emulsion Breaking
DAF - Dissolved Air Flotation
CP - Chemical Precipitation
DAF-IL - Dissolved Air Flotation of Industrial Laundry Wastewater
CP-IL - Chemical Precipitation of Industrial Laundry Wastewater
DAF-All - Dissolved Air Flotation of All Process Wastewater
CP-All - Chemical Precipitation of All Process Wastewater

11.4 Pollutant Loadings and Removals

Annual untreated, baseline, and postcompliance loadings were estimated for each of the regulatory options using the methodology described in Section 11.3 of this document. The facility-specific loadings and removals were extrapolated from the 193 in-scope facilities to represent the entire industry of 1,747 facilities. Tables 11-9 through 11-12 present the total untreated, baseline, and postcompliance loadings and the pollutant removals for all 1,747 facilities for DAF-IL, CP-IL, Combo-IL, and OC-Only. Tables 11-13 through 11-16 present the total untreated, baseline, and postcompliance loadings and pollutant removal for the 141 facilities that are excluded from the regulation as discussed in Chapter 6 for DAF-IL, CP-IL, Combo-IL, and OC-Only. Pollutant loadings and removals for Combo-IL-2LIM, which are not presented in this chapter, are similar to Combo-IL and are within the range of the DAF-IL and CP-IL pollutant loadings and removals.

Table 11-9
Summary of Pollutant Loadings and Removals for the Entire Industrial Laundries Industry for OC-Only[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	124,988,493	114,274,092	114,274,092	0	0
Oil and Grease (measured as HEM)	61,844,348	36,490,607	36,490,607	0	0
Total Suspended Solids (TSS)	83,724,856	63,680,554	63,680,554	0	0
Priority Organics					
1,1,1-Trichloroethane	76,685	57,276	45,812	11,464	20
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	15,381	12,947	12,947	0	0
Bis(2-ethylhexyl) Phthalate	188,855	134,499	134,499	0	0
Butyl Benzyl Phthalate	37,716	30,367	17,583	12,784	42
Chlorobenzene	3,469	2,760	913	1,846	67
Chloroform	130,235	126,244	126,244	0	0
Di-*n*-butyl Phthalate	19,690	10,305	10,305	0	0
Di-*n*-octyl Phthalate	14,264	11,436	11,436	0	0
Ethylbenzene	84,956	45,607	14,491	31,116	68
Isophorone	4,521	4,521	4,521	0	0
Methylene Chloride	46,980	36,140	16,946	19,194	53

Table 11-9 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	71,819	39,453	18,758	20,695	52
Phenol	13,832	13,764	13,764	0	0
Tetrachloroethene	68,481	43,027	3,860	39,167	91
Toluene	133,837	74,200	42,521	31,679	43
trans-1,2-Dichloroethene	3,970	3,970	949	3,021	76
Trichloroethene	3,382	3,382	908	2,474	73
Total Priority Organics	**918,073**	**649,899**	**476,458**	**173,442**	**---**
Nonconventional Organics					
2-Butanone	33,198	29,032	16,840	12,191	42
2-Methylnaphthalene	12,729	9,449	3,080	6,369	67
2-Propanone	228,072	162,645	81,162	81,483	50
4-Methyl-2-pentanone	23,933	19,565	13,538	6,027	31
∝-Terpineol	14,651	12,681	6,879	5,803	46
Benzoic Acid	82,274	79,119	79,119	0	0
Benzyl Alcohol	32,750	32,750	32,750	0	0
Hexanoic Acid	8,442	8,442	8,442	0	0
m-Xylene	27,456	21,680	14,766	6,914	32
n-Decane	1,107,366	698,528	420,988	277,540	40

Table 11-9 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	17,087	12,506	12,506	0	0
n-Dodecane	272,875	175,822	83,155	92,667	53
n-Eicosane	272,950	167,717	167,717	0	0
n-Hexacosane	30,489	18,219	10,995	7,225	40
n-Hexadecane	135,916	80,090	80,090	0	0
n-Octacosane	16,541	11,493	8,167	3,326	29
n-Octadecane	108,261	67,988	67,988	0	0
n-Tetracosane	18,713	15,587	15,587	0	0
n-Tetradecane	188,935	114,824	114,824	0	0
n-Triacontane	18,598	15,085	10,573	4,512	30
o-&*p*-Xylene	13,374	10,909	8,001	2,908	27
p-Cresol	0	0	0	0	0
p-Cymene	75,119	58,589	19,250	39,340	67
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**2,739,729**	**1,822,720**	**1,276,416**	**546,305**	**---**
Priority Metals and Elements					
Antimony	37,232	32,331	32,331	0	0
Arsenic	13,461	13,106	13,106	0	0

Table 11-9 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	31	31	31	0	0
Cadmium	6,689	5,633	5,633	0	0
Chromium	21,136	14,712	14,712	0	0
Copper	174,499	124,244	124,244	0	0
Lead	111,661	74,719	74,719	0	0
Mercury	184	176	176	0	0
Nickel	16,948	14,928	14,928	0	0
Selenium	100	100	100	0	0
Silver	5,006	4,605	4,605	0	0
Thallium	0	0	0	0	0
Zinc	241,329	196,771	196,771	0	0
Total Priority Metals and Elements	**628,276**	**481,355**	**481,355**	**0**	---
Nonconventional Metals and Elements					
Aluminum	767,263	678,952	678,952	0	0
Barium	94,279	72,283	72,283	0	0
Boron	36,650	34,856	34,856	0	0
Cobalt	6,397	5,334	5,334	0	0
Iron	1,314,623	1,123,687	1,123,687	0	0

Table 11-9 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	29,464	24,207	24,207	0	0
Molybdenum	13,122	9,932	9,932	0	0
Tin	6,921	5,820	5,820	0	0
Titanium	16,299	14,103	14,103	0	0
Vanadium	1,724	1,673	1,673	0	0
Yttrium	667	653	653	0	0
Total Nonconventional Metals and Elements	**2,287,409**	**1,971,499**	**1,971,499**	**0**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	349,635,773	268,645,034	268,645,034	0	0
Total Organic Carbon (TOC)	90,802,100	81,250,307	81,250,307	0	0
Total Petroleum Hydrocarbon	23,551,331	13,514,535	13,514,535	0	0

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-10
Summary of Pollutant Loadings and Removals for the Entire Industrial Laundries Industry for DAF-IL[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	124,988,493	114,274,092	107,650,388	6,623,704	6
Oil and Grease (measured as HEM)	61,844,348	36,490,607	15,997,585	20,493,021	56
Total Suspended Solids (TSS)	83,724,856	63,680,554	29,939,296	33,741,258	53
Priority Organics					
1,1,1-Trichloroethane	76,685	57,276	3,494	53,782	94
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	15,381	12,947	10,792	2,156	17
Bis(2-ethylhexyl) Phthalate	188,855	134,499	85,359	49,140	37
Butyl Benzyl Phthalate	37,716	30,367	20,477	9,891	33
Chlorobenzene	3,469	2,760	1,752	1,008	37
Chloroform	130,235	126,244	126,244	0	0
Di-*n*-butyl Phthalate	19,690	10,305	8,202	2,103	20
Di-*n*-octyl Phthalate	14,264	11,436	9,660	1,777	16
Ethylbenzene	84,956	45,607	6,604	39,004	86
Isophorone	4,521	4,521	4,521	0	0
Methylene Chloride	46,980	36,140	31,899	4,241	12

Table 11-10 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	71,819	39,453	20,270	19,183	49
Phenol	13,832	13,764	13,752	12	0
Tetrachloroethene	68,481	43,027	20,587	22,439	52
Toluene	133,837	74,200	52,013	22,187	30
trans-1,2-Dichloroethene	3,970	3,970	3,970	0	0
Trichloroethene	3,382	3,382	3,382	0	0
Total Priority Organics	**918073**	**649,899**	**422,976**	**226,923**	**---**
Nonconventional Organics					
2-Butanone	33,198	29,032	29,032	0	0
2-Methylnaphthalene	12,729	9,449	8,337	1,111	12
2-Propanone	228,072	162,645	162,606	39	<1
4-Methyl-2-pentanone	23,933	19,565	19,298	267	1
∝-Terpineol	14,651	12,681	12,655	26	0
Benzoic Acid	82,274	79,119	77,590	1,529	2
Benzyl Alcohol	32,750	32,750	32,750	0	0
Hexanoic Acid	8,442	8,442	8,442	0	0
m-Xylene	27,456	21,680	19,638	2,042	9
n-Decane	1,107,366	698,528	375,418	323,110	46

Table 11-10 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	17,087	12,506	6,791	5,715	46
n-Dodecane	272,875	175,822	60,274	115,547	66
n-Eicosane	272,950	167,717	14,861	152,856	91
n-Hexacosane	30,489	18,219	4,756	13,463	74
n-Hexadecane	135,916	80,090	27,613	52,477	66
n-Octacosane	16,541	11,493	3,390	8,102	71
n-Octadecane	108,261	67,988	14,885	53,103	78
n-Tetracosane	18,713	15,587	9,607	5,980	38
n-Tetradecane	188,935	114,824	24,519	90,306	79
n-Triacontane	18,598	15,085	7,325	7,760	51
o-&*p*-Xylene	13,374	10,909	10,481	427	4
p-Cresol	0	0	0	0	0
p-Cymene	75,119	58,589	24,097	34,492	59
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**2,739,729**	**1,822,720**	**954,366**	**868,355**	**---**
Priority Metals and Elements					
Antimony	37,232	32,331	19,372	12,959	40
Arsenic	13,461	13,106	13,105	1	<1

Table 11-10 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	31	31	31	0	0
Cadmium	6,689	5,633	3,592	2,042	36
Chromium	21,136	14,712	10,987	3,725	25
Copper	174,499	124,244	87,514	36,730	30
Lead	111,661	74,719	33,487	41,231	55
Mercury	184	176	158	18	10
Nickel	16,948	14,928	10,709	4,220	28
Selenium	100	100	100	0	0
Silver	5,006	4,605	4,098	507	11
Thallium	0	0	0	0	0
Zinc	241,329	196,771	110,764	86,007	44
Total Priority Metals and Elements	**628,276**	**481,355**	**293,916**	**187,439**	---
Nonconventional Metals and Elements					
Aluminum	767,263	678,952	481,794	197,158	29
Barium	94,279	72,283	43,953	28,331	39
Boron	36,650	34,856	34,211	645	2
Cobalt	6,397	5,334	3,877	1,456	27
Iron	1,314,623	1,123,687	626,124	497,563	44

Table 11-10 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	29,464	24,207	12,778	11,428	47
Molybdenum	13,122	9,932	9,067	864	9
Tin	6,921	5,820	4,819	1,001	17
Titanium	16,299	14,103	8,922	5,180	37
Vanadium	1,724	1,673	1,630	44	3
Yttrium	667	653	648	6	1
Total Nonconventional Metals and Elements	**2,287,409**	**1,971,499**	**1,227,823**	**743,676**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	349,635,773	268,645,034	180,326,547	88,318,487	33
Total Organic Carbon (TOC)	90,802,100	81,250,307	74,001,266	7,249,041	9
Total Petroleum Hydrocarbon	23,551,331	13,514,535	2,666,593	10,847,942	80

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-11
Summary of Pollutant Loadings and Removals for the Entire Industrial Laundries Industry for CP-IL[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	124,988,493	114,274,092	107,700,574	6,573,518	6
Oil and Grease (measured as HEM)	61,844,348	36,490,607	15,291,642	21,198,965	58
Total Suspended Solids (TSS)	83,724,856	63,680,554	32,355,394	31,325,160	49
Priority Organics					
1,1,1-Trichloroethane	76,685	57,276	31,857	25,419	44
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	15,381	12,947	3,541	9,407	73
Bis(2-ethylhexyl) Phthalate	188,855	134,499	82,622	51,877	39
Butyl Benzyl Phthalate	37,716	30,367	14,625	15,742	52
Chlorobenzene	3,469	2,760	1,876	884	32
Chloroform	130,235	126,244	126,243	1	< 1
Di-*n*-butyl Phthalate	19,690	10,305	5,718	4,587	45
Di-*n*-octyl Phthalate	14,264	11,436	10,021	1,415	12
Ethylbenzene	84,956	45,607	20,433	25,174	55
Isophorone	4,521	4,521	4,521	0	0
Methylene Chloride	46,980	36,140	11,908	24,232	67

Table 11-11 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	71,819	39,453	18,963	20,490	52
Phenol	13,832	13,764	13,764	0	0
Tetrachloroethene	68,481	43,027	20,909	22,118	51
Toluene	133,837	74,200	59,589	14,611	20
trans-1,2-Dichloroethene	3,970	3,970	3,970	0	0
Trichloroethene	3,382	3,382	3,382	0	0
Total Priority Organics	**918,073**	**649,899**	**433,942**	**215,957**	**---**
Nonconventional Organics					
2-Butanone	33,198	29,032	29,032	0	0
2-Methylnaphthalene	12,729	9,449	3,101	6,348	67
2-Propanone	228,072	162,645	162,645	0	0
4-Methyl-2-pentanone	23,933	19,565	19,565	0	0
∝-Terpineol	14,651	12,681	12,681	0	0
Benzoic Acid	82,274	79,119	79,119	0	0
Benzyl Alcohol	32,750	32,750	32,750	0	0
Hexanoic Acid	8,442	8,442	8,442	0	0
m-Xylene	27,456	21,680	19,838	1,842	8.50
n-Decane	1,107,366	698,528	348,561	349,967	51

Table 11-11 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	17,087	12,506	5,846	6,660	53
n-Dodecane	272,875	175,822	157,306	18,516	11
n-Eicosane	272,950	167,717	12,447	155,270	93
n-Hexacosane	30,489	18,219	4,379	13,840	76
n-Hexadecane	135,916	80,090	26,483	53,607	67
n-Octacosane	16,541	11,493	3,845	7,648	67
n-Octadecane	108,261	67,988	11,908	56,080	82
n-Tetracosane	18,713	15,587	8,770	6,817	44
n-Tetradecane	188,935	114,824	23,368	91,456	80
n-Triacontane	18,598	15,085	7,597	7,488	50
o-&*p*-Xylene	13,374	10,909	10,069	840	8
p-Cresol	0	0	0	0	0
p-Cymene	75,119	58,589	58,589	0	0
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**2,739,729**	**1,822,720**	**1,046,340**	**776,379**	**---**
Priority Metals and Elements					
Antimony	37,232	32,331	16,226	16,105	50
Arsenic	13,461	13,106	13,104	2	<1

Table 11-11 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	31	31	31	<1	1
Cadmium	6,689	5,633	2,999	2,634	47
Chromium	21,136	14,712	9,056	5,656	38
Copper	174,499	124,244	61,104	63,140	51
Lead	111,661	74,719	27,360	47,359	63
Mercury	184	176	176	0	0
Nickel	16,948	14,928	10,343	4,586	31
Selenium	100	100	100	0	0
Silver	5,006	4,605	4,116	489	11
Thallium	0	0	0	0	0
Zinc	241,329	196,771	59,010	137,761	70
Total Priority Metals and Elements	**628,276**	**481,355**	**203,625**	**277,733**	**---**
Nonconventional Metals and Elements					
Aluminum	767,263	678,952	416,067	262,885	39
Barium	94,279	72,283	57,445	14,838	21
Boron	36,650	34,856	29,369	5,487	16
Cobalt	6,397	5,334	3,565	1,769	33
Iron	1,314,623	1,123,687	718,241	405,446	36

Table 11-11 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	29,464	24,207	10,795	13,411	55
Molybdenum	13,122	9,932	9,922	9	<1
Tin	6,921	5,820	907	4,913	84
Titanium	16,299	14,103	9,394	4,709	33
Vanadium	1,724	1,673	1,656	17	1
Yttrium	667	653	653	<1	<1
Total Nonconventional Metals and Elements	**2,287,409**	**1,971,499**	**1,258,014**	**713,485**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	349,635,773	268,645,034	185,607,168	83,037,866	31
Total Organic Carbon (TOC)	90,802,100	81,250,307	74,623,265	6,627,042	8
Total Petroleum Hydrocarbon	23,551,331	13,514,535	2,432,698	11,081,837	82

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-12
Summary of Pollutant Loadings and Removals for the Entire Industrial Laundries Industry for Combo-IL[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	124,988,493	114,274,092	107,707,041	6,567,051	6
Oil and Grease (measured as HEM)	61,844,348	36,490,607	15,997,585	20,493,021	56
Total Suspended Solids (TSS)	83,724,856	63,680,554	32,355,394	31,325,160	49
Priority Organics					
1,1,1-Trichloroethane	76,685	57,276	31,857	25,419	44
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	15,381	12,947	10,792	2,156	17
Bis(2-ethylhexyl) Phthalate	188,855	134,499	85,359	49,140	37
Butyl Benzyl Phthalate	37,716	30,367	20,477	9,891	33
Chlorobenzene	3,469	2,760	1,888	872	32
Chloroform	130,235	126,244	126,244	0	0
Di-*n*-butyl Phthalate	19,690	10,305	8,202	2,103	20
Di-*n*-octyl Phthalate	14,264	11,436	10,021	1,415	12
Ethylbenzene	84,956	45,607	20,435	25,173	55
Isophorone	4,521	4,521	4,521	0	0
Methylene Chloride	46,980	36,140	31,899	4,241	12

Table 11-12 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	71,819	39,453	20,270	19,183	49
Phenol	13,832	13,764	13,752	12	<1
Tetrachloroethene	68,481	43,027	21,133	21,894	51
Toluene	133,837	74,200	59,661	14,539	20
trans-1,2-Dichloroethene	3,970	3,970	3,970	0	0
Trichloroethene	3,382	3,382	3,382	0	0
Total Priority Organics	**918,073**	**649,899**	**473,863**	**176,038**	**---**
Nonconventional Organics					
2-Butanone	33,198	29,032	29,032	0	0
2-Methylnaphthalene	12,729	9,449	8,337	1,111	12
2-Propanone	228,072	162,645	162,606	39	<1
4-Methyl-2-pentanone	23,933	19,565	19,565	0	0
∝-Terpineol	14,651	12,681	12,655	26	<1
Benzoic Acid	82,274	79,119	77,590	1,529	2
Benzyl Alcohol	32,750	32,750	32,750	0	0
Hexanoic Acid	8,442	8,442	8,442	0	0
m-Xylene	27,456	21,680	20,015	1,666	8
n-Decane	1,107,366	698,528	375,418	323,110	46

Table 11-12 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	17,087	12,506	6,791	5,715	46
n-Dodecane	272,875	175,822	157,306	18,516	11
n-Eicosane	272,950	167,717	14,861	152,856	91
n-Hexacosane	30,489	18,219	4,756	13,463	74
n-Hexadecane	135,916	80,090	27,613	52,477	66
n-Octacosane	16,541	11,493	3,845	7,648	67
n-Octadecane	108,261	67,988	14,885	53,103	78
n-Tetracosane	18,713	15,587	9,607	5,980	38
n-Tetradecane	188,935	114,824	24,519	90,306	79
n-Triacontane	18,598	15,085	7,597	7,488	50
o-&*p*-Xylene	13,374	10,909	10,481	427	4
p-Cresol	0	0	0	0	0
p-Cymene	75,119	58,589	24,097	34,492	59
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**2,739,729**	**1,822,720**	**1,052,768**	**769,952**	**---**
Priority Metals and Elements					
Antimony	37,232	32,331	19,372	12,959	40
Arsenic	13,461	13,106	13,105	1	<1

Table 11-12 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	31	31	31	0	0
Cadmium	6,689	5,633	3,592	2,042	36
Chromium	21,136	14,712	10,987	3,725	25
Copper	174,499	124,244	87,514	36,730	30
Lead	111,661	74,719	33,487	41,231	55
Mercury	184	176	158	18	10
Nickel	16,948	14,928	10,709	4,220	28
Selenium	100	100	100	0	0
Silver	5,006	4,605	4,116	489	11
Thallium	0	0	0	0	0
Zinc	241,329	196,771	110,764	86,007	44
Total Priority Metals and Elements	**628,276**	**481,355**	**293,935**	**187,422**	**---**
Nonconventional Metals and Elements					
Aluminum	767,263	678,952	481,794	197,158	29
Barium	94,279	72,283	57,445	14,838	21
Boron	36,650	34,856	34,211	645	2
Cobalt	6,397	5,334	3,877	1,456	27
Iron	1,314,623	1,123,687	718,241	405,446	36

Table 11-12 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	29,464	24,207	12,778	11,428	47
Molybdenum	13,122	9,932	9,922	9	<1
Tin	6,921	5,820	4,819	1,001	17
Titanium	16,299	14,103	9,394	4,709	33
Vanadium	1,724	1,673	1,656	17	1
Yttrium	667	653	653	0	0
Total Nonconventional Metals and Elements	**2,287,409**	**1,971,499**	**1,334,790**	**636,707**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	349,635,773	268,645,034	185,655,740	82,989,294	31
Total Organic Carbon (TOC)	90,802,100	81,250,307	74,625,706	6,624,600	8
Total Petroleum Hydrocarbon	23,551,331	13,514,535	2,666,593	10,847,942	80

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-13
Summary of Pollutant Loadings and Removals for the Excluded Industrial Laundries (141 Facilities) for OC-Only[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,039,528	1,013,533	1,013,533	0	0
Oil and Grease (measured as HEM)	687,931	616,915	616,915	0	0
Total Suspended Solids (TSS)	921,104	887,444	887,444	0	0
Priority Organics					
1,1,1-Trichloroethane	890	818	530	288	35
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	173	173	173	0	0
Bis(2-ethylhexyl) Phthalate	1,625	1,479	1,479	0	0
Butyl Benzyl Phthalate	351	303	151	153	50
Chlorobenzene	49	46	16	30	66
Chloroform	892	892	892	0	0
Di-*n*-butyl Phthalate	193	161	161	0	0
Di-*n*-octyl Phthalate	105	97	97	0	0
Ethylbenzene	1,092	987	128	859	87
Isophorone	17	17	17	0	0
Methylene Chloride	660	660	167	493	75

Table 11-13 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	832	740	166	574	78
Phenol	115	115	115	0	0
Tetrachloroethene	1,048	1,001	42	959	96
Toluene	1,463	1,279	458	821	64
trans-1,2-Dichloroethene	61	61	16	44	73
Trichloroethene	48	48	16	32	67
Total Priority Organics	**9,614**	**8,877**	**4,626**	**4,252**	**---**
Nonconventional Organics					
2-Butanone	386	386	195	191	50
2-Methylnaphthalene	173	169	30	139	82
2-Propanone	2,292	2,276	819	1,457	64
4-Methyl-2-pentanone	290	287	162	125	44
∝-Terpineol	170	170	58	112	66
Benzoic Acid	846	846	846	0	0
Benzyl Alcohol	229	229	229	0	0
Hexanoic Acid	53	53	53	0	0
m-Xylene	328	315	171	144	46
n-Decane	12,628	11,605	3,282	8,323	72

Table 11-13 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	190	181	181	0	0
n-Dodecane	3,631	3,378	1,013	2,365	70
n-Eicosane	4,373	4,205	4,205	0	0
n-Hexacosane	356	327	89	238	73
n-Hexadecane	1,756	1,636	1,636	0	0
n-Octacosane	193	184	67	117	64
n-Octadecane	1,629	1,560	1,560	0	0
n-Tetracosane	190	182	182	0	0
n-Tetradecane	2,751	2,607	2,607	0	0
n-Triacontane	197	188	79	109	58
o-&*p*-Xylene	142	135	95	40	30
p-Cresol	0	0	0	0	0
p-Cymene	820	715	147	568	79
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**33,623**	**31,634**	**17,708**	**13,928**	**---**
Priority Metals and Elements					
Antimony	236	230	230	0	0
Arsenic	93	93	93	0	0

Table 11-13 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	<1	<1	<1	0	0
Cadmium	73	72	72	0	0
Chromium	197	179	179	0	0
Copper	1,797	1,688	1,688	0	0
Lead	1,355	1,267	1,267	0	0
Mercury	1	1	1	0	0
Nickel	154	151	151	0	0
Selenium	2	2	2	0	0
Silver	47	45	45	0	0
Thallium	0	0	0	0	0
Zinc	2,669	2,600	2,600	0	0
Total Priority Metals and Elements	**6,624**	**6,328**	**6,328**	**0**	**---**
Nonconventional Metals and Elements					
Aluminum	5,816	5,685	5,685	0	0
Barium	945	892	892	0	0
Boron	386	386	386	0	0
Cobalt	73	69	69	0	0
Iron	12,533	12,211	12,211	0	0

Table 11-13 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	290	278	278	0	0
Molybdenum	133	121	121	0	0
Tin	60	60	60	0	0
Titanium	121	117	117	0	0
Vanadium	15	15	15	0	0
Yttrium	5	5	5	0	0
Total Nonconventional Metals and Elements	**20,377**	**19,840**	**19,840**	**0**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	3,621,646	3,447,109	3,447,109	0	0
Total Organic Carbon (TOC)	771,468	753,634	753,634	0	0
Total Petroleum Hydrocarbon	299,226	272,507	272,507	0	0

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-14
Summary of Pollutant Loadings and Removals for the Excluded Industrial Laundries (141 Facilities) for DAF-IL

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,039,528	1,013,533	770,389	243,144	24
Oil and Grease (measured as HEM)	687,931	616,915	117,506	499,408	81
Total Suspended Solids (TSS)	921,104	887,444	218,279	669,165	75
Priority Organics					
1,1,1-Trichloroethane	890	818	6	812	99
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	173	173	78	95	55
Bis(2-ethylhexyl) Phthalate	1,625	1,479	617	862	58
Butyl Benzyl Phthalate	351	303	152	152	50
Chlorobenzene	49	46	12	34	75
Chloroform	892	892	892	0	0
Di-*n*-butyl Phthalate	193	161	62	100	62
Di-*n*-octyl Phthalate	105	97	69	28	29
Ethylbenzene	1,092	987	45	942	95
Isophorone	17	17	17	0	0
Methylene Chloride	660	660	234	426	65

Table 11-14 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	832	740	137	603	81
Phenol	115	115	115	0	0
Tetrachloroethene	1,048	1,001	124	876	88
Toluene	1,463	1,279	350	929	73
trans-1,2-Dichloroethene	61	61	61	0	0
Trichloroethene	48	48	48	0	0
Total Priority Organics	**9,614**	**8,877**	**3,018**	**5,860**	**---**
Nonconventional Organics					
2-Butanone	386	386	386	0	0
2-Methylnaphthalene	173	169	64	105	62
2-Propanone	2,292	2,276	2,237	39	2
4-Methyl-2-pentanone	290	287	222	65	23
∝-Terpineol	170	170	170	0	0
Benzoic Acid	846	846	729	117	14
Benzyl Alcohol	229	229	229	0	0
Hexanoic Acid	53	53	53	0	0
m-Xylene	328	315	141	173	55
n-Decane	12,628	11,605	2,655	8,949	77

Table 11-14 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	190	181	51	131	72
n-Dodecane	3,631	3,378	326	3,052	90
n-Eicosane	4,373	4,205	111	4,094	97
n-Hexacosane	356	327	36	291	89
n-Hexadecane	1,756	1,636	199	1,438	88
n-Octacosane	193	184	25	160	87
n-Octadecane	1,629	1,560	107	1,453	93
n-Tetracosane	190	182	71	111	61
n-Tetradecane	2,751	2,607	175	2,432	93
n-Triacontane	197	188	53	135	72
o-&*p*-Xylene	142	135	103	32	24
p-Cresol	0	0	0	0	0
p-Cymene	820	715	143	572	80
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**33,623**	**31,634**	**8,284**	**23,352**	**---**
Priority Metals and Elements					
Antimony	236	230	142	88	38
Arsenic	93	93	93	0	0

Table 11-14 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	<1	<1	<1	0	0
Cadmium	73	72	27	45	63
Chromium	197	179	81	98	55
Copper	1,797	1,688	659	1,029	61
Lead	1,355	1,267	246	1,021	81
Mercury	1	1	1	<1	20
Nickel	154	151	80	71	47
Selenium	2	2	2	0	0
Silver	47	45	29	17	37
Thallium	0	0	0	0	0
Zinc	2,669	2,600	890	1,709	66
Total Priority Metals and Elements	**6,624**	**6,328**	**2,249**	**4,080**	**---**
Nonconventional Metals and Elements					
Aluminum	5,816	5,685	3,583	2,102	37
Barium	945	892	307	585	66
Boron	386	386	280	106	27
Cobalt	73	69	28	42	60
Iron	12,533	12,211	4,633	7,577	62

Table 11-14 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	290	278	95	183	66
Molybdenum	133	121	70	51	42
Tin	60	60	39	20	34
Titanium	121	117	64	53	45
Vanadium	15	15	11	4	27
Yttrium	5	5	5	<1	9
Total Nonconventional Metals and Elements	**20,377**	**19,840**	**9,115**	**10,725**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	3,621,646	3,447,109	1,361,590	2,085,519	61
Total Organic Carbon (TOC)	771,468	753,634	530,744	222,890	30
Total Petroleum Hydrocarbon	299,226	272,507	20,279	252,228	93

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-15
Summary of Pollutant Loadings and Removals for the Excluded Industrial Laundries (141 Facilities) for CP-IL[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,039,528	1,013,533	771,110	242,423	24
Oil and Grease (measured as HEM)	687,931	616,915	110,856	506,059	82
Total Suspended Solids (TSS)	921,104	887,444	240,935	646,509	73
Priority Organics					
1,1,1-Trichloroethane	890	818	209	609	74
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	173	173	28	145	84
Bis(2-ethylhexyl) Phthalate	1,625	1,479	595	884	60
Butyl Benzyl Phthalate	351	303	101	202	67
Chlorobenzene	49	46	13	33	71
Chloroform	892	892	892	0	0
Di-*n*-butyl Phthalate	193	161	42	120	74
Di-*n*-octyl Phthalate	105	97	71	26	27
Ethylbenzene	1,092	987	141	846	86
Isophorone	17	17	17	0	0
Methylene Chloride	660	660	84	576	87

Table 11-15 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	832	740	129	612	83
Phenol	115	115	115	0	0
Tetrachloroethene	1,048	1,001	127	874	87
Toluene	1,463	1,279	461	819	64
trans-1,2-Dichloroethene	61	61	61	0	0
Trichloroethene	48	48	48	0	0
Total Priority Organics	**9,614**	**8,877**	**3,134**	**5,746**	**---**
Nonconventional Organics					
2-Butanone	386	386	386	0	0
2-Methylnaphthalene	173	169	21	148	88
2-Propanone	2,292	2,276	2,276	0	0
4-Methyl-2-pentanone	290	287	287	0	0
∝-Terpineol	170	170	170	0	0
Benzoic Acid	846	846	846	0	0
Benzyl Alcohol	229	229	229	0	0
Hexanoic Acid	53	53	53	0	0
m-Xylene	328	315	147	168	53
n-Decane	12,628	11,605	2,458	9,146	79

Table 11-15 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	190	181	42	139	77
n-Dodecane	3,631	3,378	1,269	2,110	62
n-Eicosane	4,373	4,205	89	4,116	98
n-Hexacosane	356	327	32	295	90
n-Hexadecane	1,756	1,636	190	1,446	88
n-Octacosane	193	184	29	155	84
n-Octadecane	1,629	1,560	86	1,474	94
n-Tetracosane	190	182	63	119	65
n-Tetradecane	2,751	2,607	167	2,440	94
n-Triacontane	197	188	55	133	71
o-&*p*-Xylene	142	135	90	45	33
p-Cresol	0	0	0	0	0
p-Cymene	820	715	715	0	0
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**33,623**	**31,634**	**9,700**	**21,934**	**--**
Priority Metals and Elements					
Antimony	236	230	116	114	50
Arsenic	93	93	93	<1	<1

Table 11-15 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	<1	<1	<1	<1	2
Cadmium	73	72	22	50	70
Chromium	197	179	67	112	62
Copper	1,797	1,688	440	1,248	74
Lead	1,355	1,267	201	1,066	84
Mercury	1	1	1	0	0
Nickel	154	151	76	75	49
Selenium	2	2	2	0	0
Silver	47	45	29	16	37
Thallium	0	0	0	0	0
Zinc	2,669	2,600	432	2,168	83
Total Priority Metals and Elements	**6,624**	**6,328**	**1,480**	**4,851**	**---**
Nonconventional Metals and Elements					
Aluminum	5,816	5,685	2,972	2,713	48
Barium	945	892	411	482	54
Boron	386	386	215	171	44
Cobalt	73	69	25	44	64
Iron	12,533	12,211	5,519	6,692	55

Table 11-15 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	290	278	77	201	72
Molybdenum	133	121	112	9	8
Tin	60	60	8	52	87
Titanium	121	117	68	48	41
Vanadium	15	15	12	3	20
Yttrium	5	5	5	0	0
Total Nonconventional Metals and Elements	**20,377**	**19,840**	**9,424**	**10,415**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	3,621,646	3,447,109	1,399,219	2,047,890	59
Total Organic Carbon (TOC)	771,468	753,634	536,823	216,811	29
Total Petroleum Hydrocarbon	299,226	272,507	18,171	254,336	93

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material

Table 11-16
Summary of Pollutant Loadings and Removals for the Excluded Industrial Laundries (141 Facilities) for Combo-IL[1]

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Conventionals					
Biochemical Oxygen Demand 5-Day (BOD_5)	1,039,528	1,013,533	771,110	242,423	24
Oil and Grease (measured as HEM)	687,931	616,915	117,506	499,408	81
Total Suspended Solids (TSS)	921,104	887,444	240,935	646,508	73
Priority Organics					
1,1,1-Trichloroethane	890	818	209	609	74
1,2-Diphenylhydrazine	0	0	0	0	0
4-Chloro-3-methylphenol	173	173	78	95	55
Bis(2-ethylhexyl) Phthalate	1,625	1,479	617	862	58
Butyl Benzyl Phthalate	351	303	152	152	50
Chlorobenzene	49	46	14	33	71
Chloroform	892	892	892	0	0
Di-*n*-butyl Phthalate	193	161	62	100	62
Di-*n*-octyl Phthalate	105	97	71	26	27
Ethylbenzene	1,092	987	141	846	86
Isophorone	17	17	17	0	0
Methylene Chloride	660	660	234	426	65

Table 11-16 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Naphthalene	832	740	137	603	81
Phenol	115	115	115	0	0
Tetrachloroethene	1,048	1,001	128	873	87
Toluene	1,463	1,279	461	819	64
trans-1,2-Dichloroethene	61	61	61	0	0
Trichloroethene	48	48	48	0	0
Total Priority Organics	**9,614**	**8,877**	**3,436**	**5,442**	**---**
Nonconventional Organics					
2-Butanone	386	386	386	0	0
2-Methylnaphthalene	173	169	64	105	62
2-Propanone	2,292	2,276	2,237	39	2
4-Methyl-2-pentanone	290	287	287	0	0
∝-Terpineol	170	170	170	0	0
Benzoic Acid	846	846	729	117	14
Benzyl Alcohol	229	229	229	0	0
Hexanoic Acid	53	53	53	0	0
m-Xylene	328	315	147	168	53
n-Decane	12,628	11,605	2,655	8,949	77

Table 11-16 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
n-Docosane	190	181	51	131	72
n-Dodecane	3,631	3,378	1,269	2,110	62
n-Eicosane	4,373	4,205	111	4,094	97
n-Hexacosane	356	327	36	291	89
n-Hexadecane	1,756	1,636	199	1,438	88
n-Octacosane	193	184	29	155	84
n-Octadecane	1,629	1,560	107	1,453	93
n-Tetracosane	190	182	71	111	61
n-Tetradecane	2,751	2,607	175	2,432	93
n-Triacontane	197	188	55	133	71
o-&*p*-Xylene	142	135	103	32	24
p-Cresol	0	0	0	0	0
p-Cymene	820	715	143	572	80
Pentamethylbenzene	0	0	0	0	0
Total Nonconventional Organics	**33,623**	**31,634**	**9,306**	**22,330**	**---**
Priority Metals and Elements					
Antimony	236	230	142	88	38
Arsenic	93	93	93	0	0

Table 11-16 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Beryllium	<1	<1	<1	<1	2
Cadmium	73	72	27	45	63
Chromium	197	179	81	98	55
Copper	1,797	1,688	659	1,029	61
Lead	1,355	1,267	246	1,021	81
Mercury	1	1	1	<1	20
Nickel	154	151	80	71	47
Selenium	2	2	2	0	0
Silver	47	45	29	17	37
Thallium	0	0	0	0	0
Zinc	2,669	2,600	890	1,709	66
Total Priority Metals and Elements	**6,624**	**6,328**	**2,250**	**4,080**	---
Nonconventional Metals and Elements					
Aluminum	5,816	5,685	3,583	2,102	37
Barium	945	892	411	482	54
Boron	386	386	280	106	27
Cobalt	73	69	28	42	60
Iron	12,533	12,211	5,519	6,692	55

Table 11-16 (Continued)

Pollutant of Concern	Industry Raw Wastewater Pollutant Loading (lbs/yr)	Industry Baseline Wastewater Pollutant Loading (lbs/yr)	Industry Post-Compliance Wastewater Pollutant Loading (lbs/yr)	Industry Pollutant Removal from Baseline (lbs/yr)	Percentage Removal from Baseline (%)
Manganese	290	278	95	183	66
Molybdenum	133	121	112	9	8
Tin	60	60	39	20	34
Titanium	121	117	68	48	41
Vanadium	15	15	12	3	23
Yttrium	5	5	5	0	0
Total Nonconventional Metals and Elements	**20,377**	**19,840**	**10,151**	**9,688**	**---**
Bulk Nonconventionals					
Chemical Oxygen Demand (COD)	3,621,646	3,447,109	1,399,220	2,047,890	59
Total Organic Carbon (TOC)	771,468	753,634	536,823	216,811	29
Total Petroleum Hydrocarbon	299,226	272,507	20,279	252,228	93

[1]Numbers in this table were calculated using more significant figures than shown.
HEM - Hexane extractable material
SGT-HEM - Silica get treated-hexane extractable material